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FIRST LINES IN DISPENSING

E. W. LUCAS & H. B. STEVENS

SECOND EDITION

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FIRST LINES
IN
DISPENSING

BY

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PREFACE

The following pages were written primarily for students, nurses, and others whose calling necessitates an acquaintance with the art of compounding medicines. As dispensing in its widest sense requires a comprehensive and practical knowledge of pharmacy generally, it will be understood that a work of this description can only serve as an introduction to the subject.

E. W. L.

LONDON: *October*, 1908.

PREFACE TO SECOND EDITION

An endeavour has been made in this edition to bring the book into line with elementary examination requirements. Particular attention has been given to the article on Weights and Measures; remarks on General Pharmacy have been extended; the chapter on Percentage Solutions has been re-written, and, it is hoped, simplified. A chapter on Ampoules and a special table of Solubilities have been introduced.

E. W. L.
H. B. S.

LONDON: *June*, 1919.

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FIRST LINES IN DISPENSING

THE DISPENSARY

The choice of the room intended for use as a dispensary rarely lies with the dispenser. In many institutions the greatest care has been exercised both in the selection of the position and the fitting-up of this important office, while in others the very opposite has apparently ruled.

Light and space are the chief desiderata. The working benches should be in front of the windows, the shelving or staging for bottles being arranged behind the dispensers. No shelf carrying any article in common use should be so high as to be out of reach.

The working benches should be made of hard wood and be about 3 feet wide. Each dispenser requires about 6 feet run of bench room. The drawers of the bench may contain corks, labels, ointment slabs, knives, spatulas, &c., while mortars, funnels, pill-machines, &c., may conveniently be stored on shelving below. No article should be kept on shelves nearer to the floor than about 12 inches. The back of the bench is often fitted with narrow shelving, carrying little articles in frequent demand, as pill-excipients, paste-pot, pill-coating apparatus, suppository-moulds, glass graduates, straining-funnels, &c.

The arrangement of the shelving must necessarily be dependent upon the nature of the dispensing. If many 'stock-mixtures' are used, these should occupy the most convenient position. When kept in jars, taps must be selected the nozzles of which fit comfortably into the necks of mixture bottles. To prevent dripping, each tap should be provided with a drip-catcher.

Labelling.—All stock bottles and other containers should be labelled in the plainest and boldest manner. The most conspicuous is black lettering on a white ground. For the sake of contrast, poison labels may be in red lettering. If paper labels are used they must be sized and varnished, when they last a very long time. Every part of the label should be visible from the front. Compare fig. 1 with fig. 2. Labels that extend three-quarters of the way round the bottle are dangerous in the extreme. In the first example the label cannot possible be misinterpreted, but the one shown in fig. 2 might represent either the *simple* or the *compound* powder of ipecacuanha. No essential part of the label should be hidden from view, and no abbreviations should be used which permit of more than one rendering. Thus 'Acid. Hyd. Dil.' might mean Acid. Hydrocyan. Dil., Acid. Hydrochlor. Dil., or Acid. Hydrobrom. Dil. These three acids are in common use.

If it is not found convenient to employ printed labels, they should be stencilled, and the blank spaces filled in with Chinese ink. Such labels, when sized and varnished, leave little to be desired as regards legibility.

Size.—Gelatin 1 part, water 30 parts. Stand until the gelatin softens, then melt by application of gentle heat. Apply thinly over the labels, and allow at least twenty-four hours to elapse before varnishing. Hard paper-varnish is the best. Apply evenly, and take care to extend the varnish well over the edges of the labels. For acids, glycerins, oils, &c., labels are preferably etched on the glass. The method is inexpensive, and of course the labels last as long as the bottles.

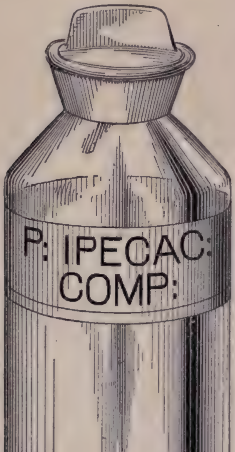

FIG. 1.

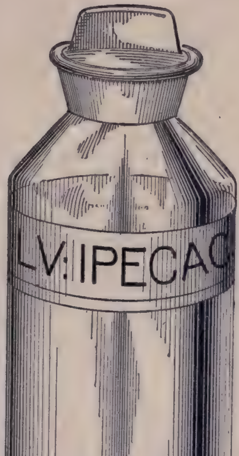

FIG. 2.

While on the subject of bottles, it may be convenient to mention the methods adopted for removing stoppers that have become tightly fixed. These depend on the cause of the adhesion, and on the size, form and thickness of the bottle and its stopper. Should twisting and pulling fail, the stopper may be gently tapped with the wooden handle of a palette-knife. If this fails, a stopper-extractor (fig. 3) may be tried. This consists of a piece of hard wood, pierced with holes of different sizes, into one of which the stopper is placed, and twisting again tried. Care and judgment must be exercised or the stopper will probably break off.

If none of the foregoing proves effectual, other means must be adopted. Thus, if resinous or other matter soluble in alcohol is the cause of the adhesion, spirit may be placed in the groove between the stopper and the lip of the bottle, and after allowing a little time to elapse the stopper-extractor may be again tried. Should the deposit be insoluble in alcohol, other solvents, as ether, oil, &c., may be used. Another plan is to warm the neck of the bottle over a small Bunsen flame. The immediate result of the warming is to expand the bottle neck, thus relaxing the grip on the stopper, which may often be readily withdrawn. The glass must be warmed uniformly, and the whole operation completed before the heat is communicated to the stopper, which may or may not expand equally with the bottle. Should the bottle contain liquid of an inflammable nature, the application of a flame is unsafe, in which case a strip of cloth dipped in hot water may be used instead; or a piece of stout string may be passed round the bottle neck, one end

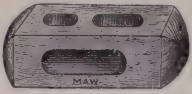

FIG. 3.—STOPPER-EXTRACTOR.

being fastened to some stationary object, the other held firmly in the left hand. If now the bottle is grasped in the right hand and moved rapidly backwards and forwards, sufficient heat will be generated by friction for the purpose. As prevention is better than cure, it is a good plan to smear with soft paraffin the stoppers of all bottles that are only occasionally opened.

WEIGHTS AND MEASURES

The imperial system of weights and measures is based on two arbitrary units—the *yard*, the unit of *length*, and the *pound*, the unit of *weight*. From these two units all measures of length, weight and volume are derived. For instance, the standard of *capacity* is the *gallon*, this being the volume occupied by 10 pounds' weight of distilled water under standard conditions. In 1897 a Bill legalising the weights and measures of the metric system came into operation, and two units, also arbitrary, were adopted. These are known as the *Metre-International*, the unit of length, and the *Kilogramme-International*, the unit of weight.

Imperial Measures of Length

	Approximate Metric Equivalents.
1 inch	in. = 25·4 millimetres
1 foot (12 inches) . .	ft. = 304·8 ”
1 yard (3 feet) . . .	yd. = 0·914 metre

Conversion Factors

Inches × 25·4 = millimetres. Inches × 0·0254 = metres
Millimetres × 0·04 = inches. Metres × 39·37 = inches

Imperial Weights (Avoirdupois)

	Approximate Metric Equivalents.
1 grain	gr. = 0·0648 gramme
1 ounce (437½ grains) . .	oz. = 28·35 grammes
1 pound (16 ounces or 7000 grains) .	lb. = 453·6 „

Conversion Factors

Grains × 0·0648 = grammes. Ounces av. × 28·35 = grammes.
Grammes × 15·432 = grains. Grammes × 0·035 = ounces av.

Imperial Weights (Apothecaries')

	Latin.	Approximate Metric Equivalents.
1 grain	Granum .	gr = 0·0648 gramme
1 scruple (20 grains) .	Scrupulus .	℈j = 1·3 „
1 drachm (3 scruples) .	Drachma .	ʒj = 3·9 grammes
1 ounce (8 drachms) .	Uncia .	℥j = 31·1 „

Conversion Factors

Grains × 0·0648 = grammes. Ounces × 31·1 = grammes.
Grammes × 15·432 = grains. Grammes × 0·031 = ounces apoth.

Imperial Measures of Capacity (Apothecaries')

	Latin.	Approximate Metric Equivalents.
1 minim[1]	Minimum .	♏j = 0·06 cubic centimetre
1 fluid drachm (60 minims) .	Drachma .	ʒj = 3·55 cubic centimetres
1 fluid ounce (8 fl. drachms) .	Uncia . .	℥j = 28·41 „
1 pint (20 fluid ounces) .	Octarius .	Oj = 568·24 „
1 gallon (8 pints) . . .	Congius .	Cj = 4546·0 „

Conversion Factors

Minims × 0·0592 = c.c. Fl. ounces × 28·41 = c.c.
C.c. × 16·894 = minims. C.c. × 0·035 = fl. ounces.

In dispensing it is necessary to know the following equivalents when translating the 'directions to the patient':

---

[1] It must be remembered that the minim does not correspond to a fluid grain, but is only about $\frac{9}{10}$ths.

1	fluid drachm	(ʒj)	becomes	one teaspoonful
2	,, drachms	(ʒij)	,,	two teaspoonfuls or one dessertspoonful
4	,, ,,	(ʒiv)	,,	one tablespoonful
1	,, ounce	(℥j)	,,	two tablespoonfuls

Metric Measures of Length

1 millimetre ($\frac{1}{1000}$ metre)	0·001 metre	=	0·03937 inches
1 centimetre ($\frac{1}{100}$,,)	0·01 ,,	=	0·39371 ,,
1 decimetre ($\frac{1}{10}$,,)	0·1 ,,	=	3·93708 ,,
1 metre	1·0 ,,	=	39·37079 ,,
1 decametre	10·0 metres		
1 hectametre	100·0 ,,		
1 kilometre	1000·0 ,,		

Metric Weights

1 milligramme ($\frac{1}{1000}$ gramme)	0·001 gramme	=	0·01543 grains
1 centigramme ($\frac{1}{100}$,,)	0·01 ,,	=	0·15432 ,,
1 decigramme ($\frac{1}{10}$,,)	0·1 ,,	=	1·5432 ,,
1 gramme	1·0 ,,	=	15·432 ,,
1 decagramme	10·0 grammes		
1 hectagramme	100·0 ,,		
1 kilogramme	1000·0 ,,		

Metric Measures of Capacity

1 cubic centimetre or 1 millilitre ($\frac{1}{1000}$ litre) 1 c.cm. or 1 mil } = 16·9 minims

1 ,, decimetre or 1 litre . . . 1000 c.cm. = 1·76 pints

Useful Approximate Equivalents

1 metre . . . . . . = 39⅖ inches
1 gramme . . . . . = 15½ grains
1 cubic centimetre or 1 millilitre = 17 minims
1 litre . . . . . . = 1¾ pints
1 kilogramme . . . . = 2⅕ lbs.
1 centimetre . . . . = ⅖ inches

WEIGHING AND MEASURING

The balance.—The balance is an instrument for determining the relative masses or weights of bodies—in other words, the measure of their gravitating force. The ordinary dispensing-balance (fig. 4) consists of a beam from the extremities of which are suspended two pans. Some dispensers prefer balances having one of the pans made of glass. The only objection is the liability to chip when tapped upon the edges of mortars and measures, which, unless noticed, may very seriously affect the subsequent weighings. In many dispensaries

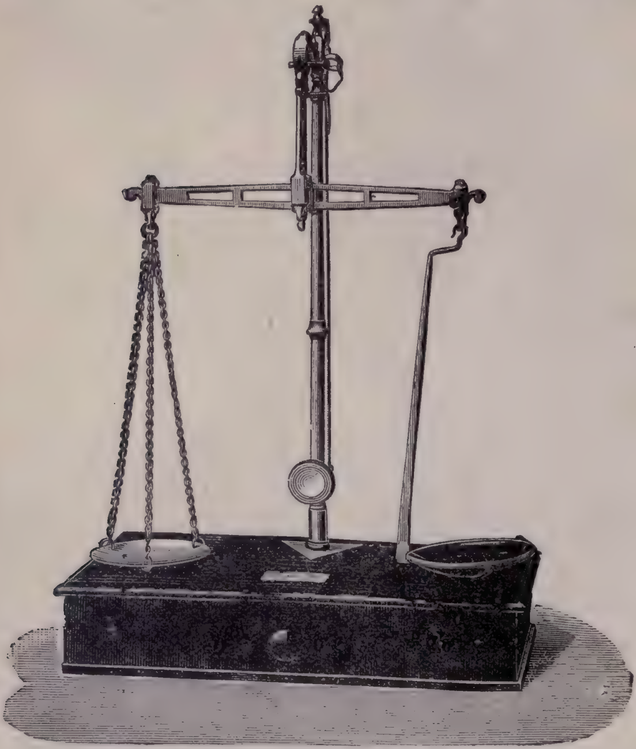

FIG. 4.—DISPENSING-BALANCE.

a *hand-balance* (fig. 5) is prefered for general use. Its advantages depend upon the rapidity with which weighings may be made, as well as the fact that, owing to the portable form, such a balance may be carried from one place to another for the purpose of making a weighing, instead of bringing all materials to the balance. The hand-balance should be made of best steel, the beam about 7 inches long. The knife-edges at the ends of the beam should be contained in boxes to protect them from injury. Dispensing-balances of this kind are usually provided with nickelled pans. Most medicinal substances may be weighed directly on these pans without harm, but such chemicals as iodine, phosphorus, mercuric salts, &c., should be weighed on glass. For this purpose it is convenient to keep a pair of accurately balanced watch-glasses which lie comfortably on the metal pans. If money is no great object, the right-hand pan, on which the substance is invariably placed, may be made of platinum, this metal being attacked by very few chemicals in the cold.

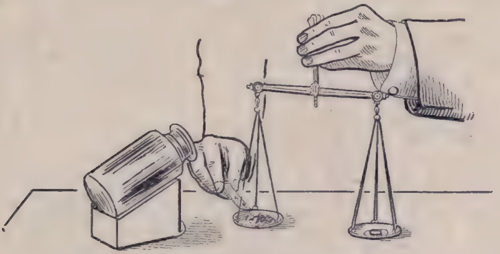

FIG. 5.—HAND-BALANCE.

The manner of holding the balance is shown in fig. 5, the tassel being grasped between the thumb and finger of the left hand, the other fingers resting against the frame to ensure steadiness. When weighing, hand-balances should only be raised a short distance from the bench, and on no account should the practice of raising the balance to the level of the eye be encouraged.

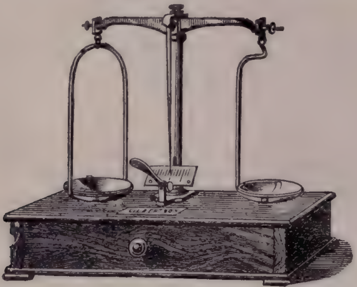

FIG. 6.—SENSITIVE POISON-BALANCE.

For weighing quantities of 2 grains and under, a more sensitive balance than either of the foregoing is necessary. Fig. 6 shows one capable of weighing to a tenth of a grain. The bearings are of hardened steel, working on agate planes, and the instrument is provided with a pointer and index.

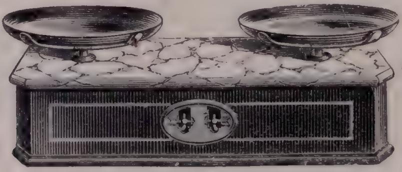

FIG. 7.—COUNTER-BALANCE.

On the other hand, for weighing large quantities of material, balances of much stronger construction are required. The patterns in most common use are known as 'inverted' or counter machines. When the load does not exceed 2 lb., the pattern shown in fig. 7 finds many applications; but it must be remembered that these machines possess so many bearings that they are far less delicate than the types hitherto described.

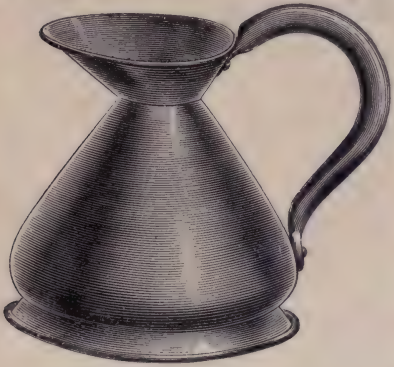

Fig. 8.—Copper Measure.

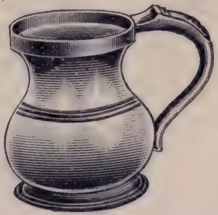

Fig. 9.—Pewter Measure.

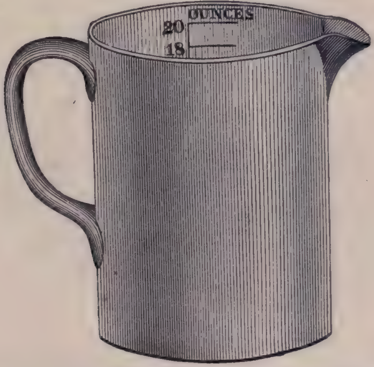

Fig. 10.—Graduated Earthenware Jug.

Measures.—For measuring large volumes of liquids which have no action on the metal, copper vessels, tinned inside, as fig. 8, are usually employed. In measures of this description the proper volume is indicated *when the liquid corresponds with the constricted portion of the neck*, and not when filled to the brim. Pewter measures of the type illustrated by fig. 9 contain the designated volume *when brim full*. For those occasions when *metal* measures are unsuitable the graduated earthenware jugs shown in fig. 10 are exceedingly useful, although not as a rule very accurate.

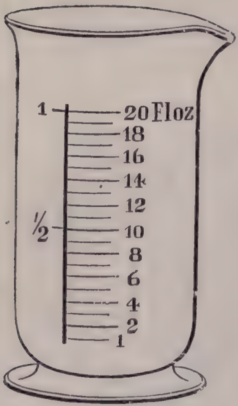

Fig. 11.—Glass Graduate.

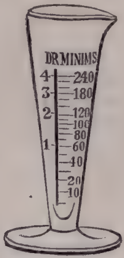

Fig. 12.—Conical Graduate.

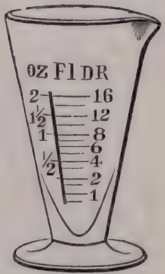

Fig. 13.—Conical Graduate.

The foregoing types of measures cannot be used for compounding medicines for obvious reasons. They are too large and not sufficiently accurate. Glass measuring-vessels are employed for dispensing purposes. For quantities from 10 to 40 fluid ounces, cylindrical graduates of the type shown in fig. 11 are commonly used, but for smaller volumes the measures should be conical, as figs. 12 and 13. The graduations, which are in pairs, front and back, should not be too close together in any measure. A 20-oz. graduate cannot accurately be used to measure smaller fractions than half a fluid ounce. The following graduates are a necessary equipment of the dispensing-bench: 20 fl. oz., 10 fl. oz., 2 fl. oz., and 2 fl. dr. (120 minims). For measuring small quantities of potent remedies, such as hydrocyanic acid, solution of strychnine, &c., a minim pipette should be used. This consists of a narrow glass tube fitted with a plunger like an ordinary syringe, and graduated from 1 minim to 60 minims (fig. 14).

When measuring liquids with glass graduates, the *lower side* of the meniscus (the crescent formed by capillarity) must be made to coincide with both graduations. At first considerable difficulty may be experienced in holding the measure level—small measures are always held by the foot—and until the habit is acquired the student is recommended to check the measurements by placing the glass on a level surface. Another very important point may also be noted here—viz. that under no circumstances should one measuring be made on the top of another. Not

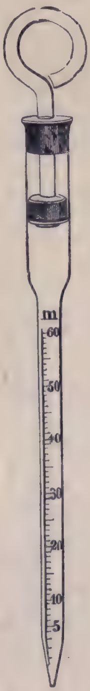

Fig. 14.—Minim Pipette.

only is the danger of error increased, but should too much of the second liquid be taken, both are wasted.

HEAT

Do not confound *heat* and *temperature.* Heat is the *cause* of change of temperature. The temperature indicates the relative condition of the body; in other words increase of temperature is the *effect* of the absorption of heat.

Effects of heat are:

(1) Increase of temperature.

(2) Expansion.

(3) Change of state of aggregation (solid → liquid → vapour).

(4) Change of chemical constitution.

Measurement of heat.—Instruments for comparing the sensible heat of bodies are termed *thermometers.* The liquid used in their construction may be either mercury or alcohol—the former because it boils at a very high temperature (357° C.), the latter because it does not solidify except under extreme cold (130° C. below zero). The *Centigrade* thermometer, which is almost exclusively used in pharmacy, consists of a closed glass tube of very fine bore, one end of which is blown out to form a reservoir. Zero (0° C.) corresponds to the temperature of melting ice, and 100° C. to the temperature of water boiling under normal pressure (760 millimetres of mercury). The interval between these two points is divided into 100 parts, which are called degrees. Degrees below zero are designated by the minus sign; thus, − 10° C. means 10 degrees below the freezing-point of water.

Although the centigrade scale is generally used by chemists, that devised by Fahrenheit is in common domestic use in this country. The higher fixed point is that of the temperature of boiling water, but the zero is that indicated by a mixture of equal parts of common salt and pounded ice, the interval between the two points being divided into 212 degrees. According to Fahrenheit's scale, ice melts at 32°, therefore 180° F. are equal to 100° C., or 1° F. is equal to $\frac{5}{9}$° C. In converting degrees F. into degrees C. 32 must first be subtracted in order that the degrees may both count from the same part of the scale; then, as 1° F. corresponds to $\frac{5}{9}$° C., it is only necessary to multiply by 5 and divide by 9. $C = \frac{(F - 32) \times 5}{9}$ where C = degrees centigrade, F = degrees Fahrenheit. Conversely, to convert degrees centigrade into degrees Fahrenheit, we multiply by 9, divide by 5, and add 32: $F = \frac{C \times 9}{5} + 32$.

Heating-appliances.—The most convenient source of heat at the dispensing-bench is one of the many forms of Bunsen burner. This consists of a small gas-burner, so arranged that a sufficiency of air is drawn in and mixed with the gas to ensure complete combustion, thus giving a very hot non-luminous flame. Fig. 15 shows a standard rose bunsen; the flame-holes are protected by a rim and slope upward to prevent wet running into the burner, as so often happens when liquids boil over. The correct distance between the top of the burner and the bottom of the vessel is about an inch.

Small vessels may be supported over the burner by tripods (fig. 16), or by the contrivance shown in fig. 17.

This consists of a small bunsen fixed to a short standard. The burner may be used for heating flasks, &c., a ring support being supplied which may be raised or depressed at will; or the burner may be bent over at an angle and

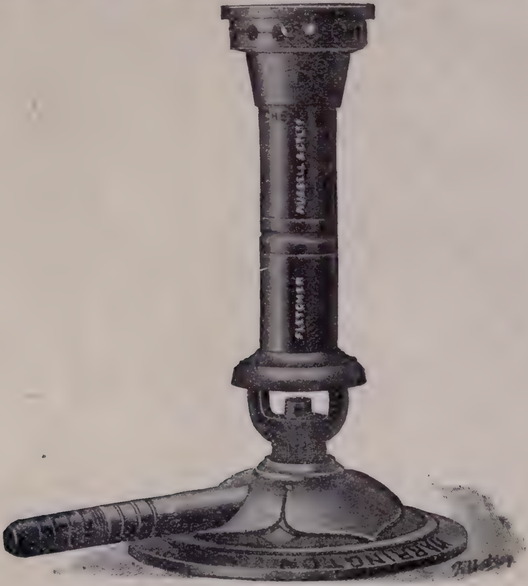

FIG. 15.—ROSE BUNSEN BURNER.

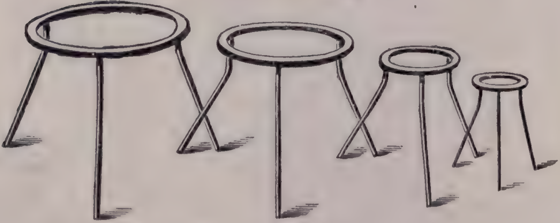

FIG. 16.—TRIPODS.

utilised for a sealing-jet. Instead of a tripod, vessels may be supported over a burner by a retort-stand. That illustrated at fig. 18 has the rod surrounded by a stout brass tube, to which the rings are clamped. By this means all the rings may be raised or lowered simultaneously, while each ring may be moved independently.

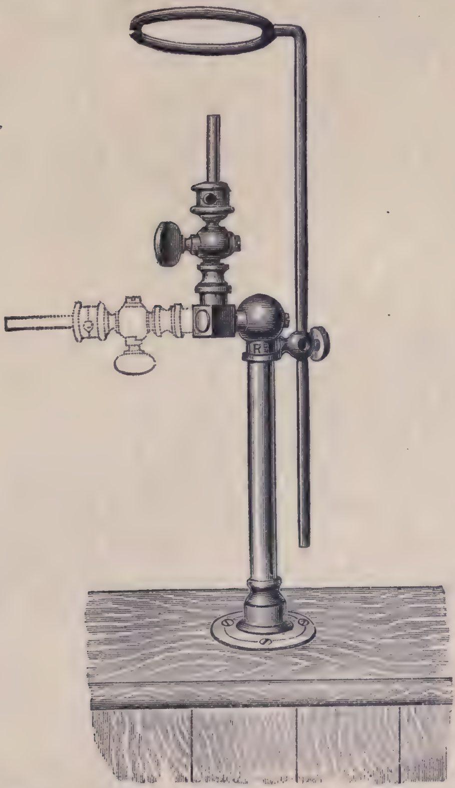

Fig. 17.—Small Bunsen and Support for Dispensing-bench.

The burners hitherto described require the vessels to be supported over the flame by tripods or other device. This is sometimes very inconvenient, and the argand Bunsen shown in fig. 19 is specially designed to overcome this objection.

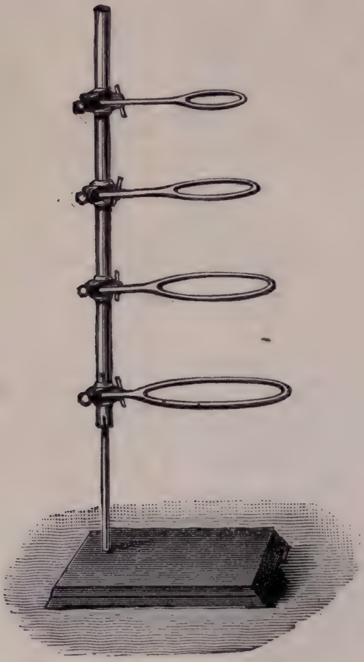

FIG. 18.—RETORT-STAND.

In lighting and turning down Bunsens, care must be taken that the flame is not left too low, as, unless the air and gas inlets are accurately adjusted, it will jump back. When this occurs, a disagreeable odour, caused by the gas burning in an insufficient air-supply, will become apparent.

When a gas-supply is not at hand, recourse may be had to a spirit-lamp (fig. 20). The flame is not as hot or as manageable as a Bunsen flame, but it is nevertheless useful in many small operations.

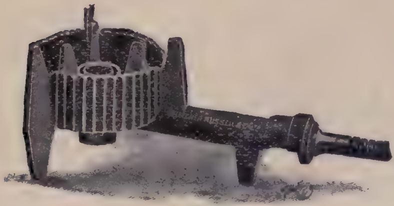

FIG. 19.—ARGAND BUNSEN.

FIG. 20.—SPIRIT-LAMP.

Water-baths.—Water boils under ordinary conditions at 100° C. (212° F.). If the water is boiled in a saucepan and a dish fitted on in place of a lid, a water-bath is formed. Any liquid placed in the dish will be heated by the steam to a temperature of nearly 100° C., and if the evaporated water in the saucepan is replaced, the liquid in the dish will slowly evaporate. This simple means of maintaining a constant temperature is frequently made use of in pharmaceutical operations. Fig. 21 shows a saucepan fitted with rings to adapt

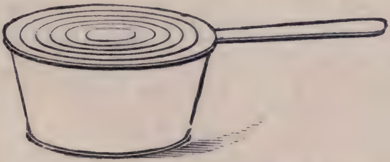

FIG. 21.—SAUCEPAN WITH RINGS.

it for use with dishes and flasks of various sizes. Fig. 22 illustrates a rather more elaborate piece of apparatus used for melting ointments, &c., but, if not available, an extract-jar of convenient size placed in a saucepan of boiling water answers almost as well.

PHARMACEUTICAL OPERATIONS

Distillation.—When water is heated in an open vessel it is converted into vapour—that is, it evaporates. If a cold plate is held over the vapour as it rises, it will be found covered with beads of water; in other words, the vapour has been condensed. If instead of using a plate the vapour is led into a tube kept cool with running water, the whole of the condensed water can be recovered: it constitutes distilled water. On a large scale the water is heated in a boiler, termed a *still*, and the steam is condensed in a spiral tin tube, called a *worm* condenser, which is immersed in a tank of suitable size supplied with running cold water (fig. 23). The condensed vapour is termed the *distillate.*

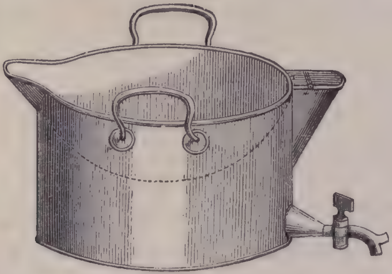

FIG. 22.—WATER-BATH.

Small quantities of liquids may be distilled in a glass flask connected with a *Liebig's* condenser. Fig. 24

shows how a small apparatus may be fitted up. The condenser consists of a piece of glass tubing which fits inside a larger tube, the joints at either end being made with cork or rubber. The cooling water is run in by means of the funnel and escapes at the end next the distilling flask. By this means the exit tube is kept cool, although the water running away from the condenser may be quite hot.

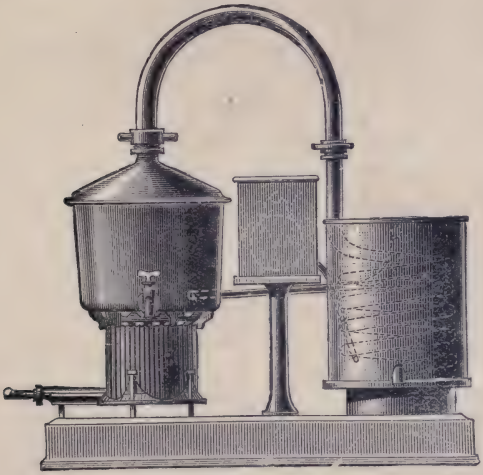

FIG. 23.—WATER-STILL.

Sometimes the condenser is so arranged that the distillate continually flows back to the distilling flask. It is then called a *reflux* condenser.

Fractional distillation is the process of separating liquids having different boiling-points, by collecting the distillate in fractions.

Destructive distillation is the process of decomposing crude organic substances in retorts at a high temperature. Wood treated in this manner yields methyl alcohol, creosote, acetone, acetic acid, &c., in the distillate, the residue consisting of charcoal.

Sublimation is the principal of distillation applied to solid bodies which are volatile, but not decomposed by heat (calomel). In this case the condensed vapour is termed the *sublimate*.

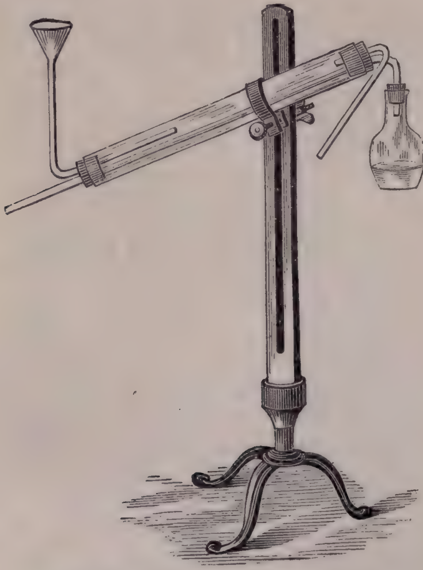

Fig. 24.—Distilling Apparatus.

Calcination is the process of heating a substance to a high temperature with the object of driving off volatile constituents. It is essentially a process of chemical decomposition.

Marble (calcium carbonate) treated in this way loses carbon dioxide (CO_2), leaving a residue of quicklime (CaO).

Incineration is the process of heating organic substances in the air until moisture and organic matter are removed.

Cream of tartar (acid potassium tartrate) treated in this way leaves a residue of potassium carbonate (K_2CO_3).

Pulverisation.—Crystalline substances and solid chemicals in general may be readily ground to fine powder by means of the mortar and pestle. When carried out in the dry state the operation is known as *trituration.*

Many insoluble substances are more readily reduced to impalpable powder when ground in the moist state. The operation is then known as *levigation.*

Dessication.—A desiccated substance is a substance deprived of its moisture. If, for instance, fresh orange-peel is placed in a warm place, it will gradually lose water and shrivel up—in other words, it will be desiccated. Nearly all the drugs used in pharmacy are deprived of their moisture by exposure to natural or artificial heat, otherwise decomposition would set in and render them worthless.

Many chemical substances, although apparently dry, really contain water held in combination. This is termed 'water of crystallisation,' and when the crystals are heated this water is driven off, the dehydrated salts becoming opaque. When thus dried they are said to be *exsiccated.*

In the dispensary it is often necessary to dry small quantities of vegetable extracts for pills, suppositories, &c. This is conveniently accomplished in a little apparatus of the type shown in fig. 25, called a hot-water oven. It consists of a double-walled copper oven, the space between the walls being filled with water kept hot by a Bunsen burner placed below. Any substances placed in the oven are heated to a temperature of *nearly* 100° C. (212° F.). Besides the drying of extracts, &c., the oven may be used for melting small quantities of ointments or oil of theobroma for suppositories. A shelf is generally fixed across the middle, so that a number of small dishes may be heated at the same time. On the left is an arrangement to take two funnels. Hot filtration is employed to expedite the clarification of oils, glycerins, &c., which at ordinary

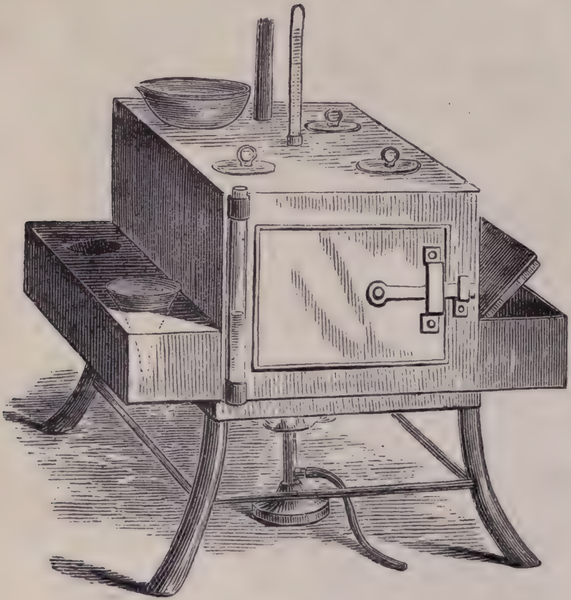

FIG. 25.—HOT-WATER OVEN.

temperatures filter but slowly. The hot-water box on the right may be used for drying test-tubes, vials, &c. In addition to the foregoing, other operations may be carried on at the same time in dishes placed over the holes at the top, where they are heated by the escaping steam.

Comminution.—Under the head of comminution is included the reduction of drugs to fine particles by mechanical means. All substances to be powdered must be dry. Small quantities of crude drugs may be powdered in a metal mortar (fig. 26). After rubbing and pounding as long as seems necessary, the materials should be turned out on to a sieve placed over a sheet of paper, and gently shaken. The fine powder will pass through, while the larger particles will be retained, and may be again pounded. By alternately pounding and sifting, all the material is obtained in an even state of division. A word of caution is here necessary. Supposing four ounces of belladonna leaves, No. 20 powder, to be required, it would not be correct to take

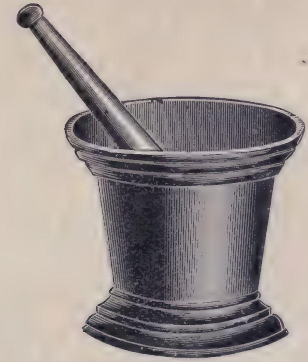

FIG. 26.—MORTAR AND PESTLE.

about eight ounces of the leaves and alternately pound and sift them until the required weight is obtained. The reason for this is that the active constituents of plants are not evenly distributed through the different tissues. In the case of belladonna leaves the alkaloids are present chiefly in the mid-rib and leaf-stalk, and as these parts are fairly tough, it follows that the powder first produced would be weak in alkaloids. The correct method is to take a quantity of the crude drug *slightly* in excess of that required, to allow for loss during the operation. While on the subject of sieves, it should be noted that fineness is designated by the number of holes in a linear inch. Thus a 20-hole sieve has 20 holes in an inch, or $20 \times 20 = 400$, *in a square inch.* Such a sieve would be described as rather coarse. Finer powders are made to pass through 60, 80, and even 120 holes in a linear inch. These are known as 'regulated powders.'

Although most substances are easily reducible to powder by simply rubbing in a mortar, a few require special treatment. Thus, camphor needs to be moistened with a few drops of alcohol when powdering; while spermaceti, which is occasionally given in the form of an emulsion (*q.v.*), can only be powdered by the help of a drop or two of oil.

Extraction of the active principles of drugs.—The methods in general use for extracting the active principles of drugs are *infusion, decoction, maceration* and *percolation.* The method to be adopted in the case of any specific drug is decided both by the nature of the drug and the solvent.

Infusion is the name applied to the process whereby the drug is exhausted by steeping it in water—usually boiling, but sometimes cold—for a definite time and then straining off the liquor. To obtain uniform results the drug should be in a definite state of comminution.

The operation is usually carried out in an earthenware pot (fig. 27), the method being to (*a*) rinse out pot with boiling water; (*b*) place prepared drug in bottom of pot; (*c*) add the boiling water; (*d*) cover and allow to stand specified time; (*e*) strain off the liquor.

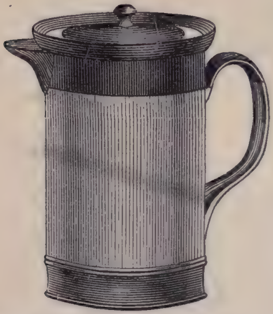

FIG. 27.—INFUSION POT.

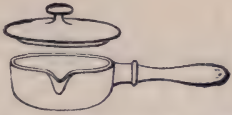

FIG. 28.—DECOCTION VESSEL.

The strength of infusions is usually 1 ounce of drug to 1 pint of water. The time of infusion varies from 15 minutes to one hour. Infusions of calumba and quassia are made with *cold* water.

Decoction differs from infusion in that the water and drug are boiled together. The operation is best carried out in an earthenware, copper, aluminium or enamelled vessel (fig. 28), the method being to (*a*) place prepared drug and water in the vessel; (*b*) bring to the boil; (*c*) allow to simmer gently for the specified time; (*d*) strain while hot; (*e*) pour distilled water over contents of strainer to make the decoction up to the required volume. The time of decoction is usually 10 minutes.

Maceration.—This term is used when the bruised drug is steeped in alcohol for a definite period—generally seven days—with occasional agitation, so that all parts of the drug are brought into intimate contact with the solvent. At the end of the macerating period the solution, now called a *tincture,* is poured off, the exhausted drug strongly expressed and the two liquids mixed together and filtered. The pressed drug is termed the '*marc.*' The process of maceration is carried out at ordinary room temperature. If carried out at a somewhat higher temperature it is called *digestion.*

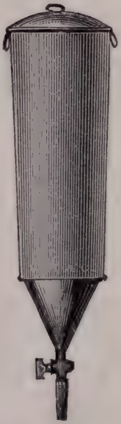

FIG. 29.—CYLINDRICAL PERCOLATOR.

Percolation.—As its name implies, percolation consists in allowing the alcohol to trickle or percolate through a column of the bruised material packed in a cylindrical vessel in such a way that every solid particle is in turn submitted to the solvent action of the descending fluid. The vessel in which the operation is carried out is called a *percolator* (figs. 29 and 30) and the liquid collected is called the *percolate.* At the end of the operation the wet mass in the cylinder is removed and pressed, and the liquid, after filtration, mixed with the first portion, the whole constituting a *tincture* or *liquid extract.*

Solution.—When a lump of sugar (the *solute*) is placed in a cup of water (the *solvent*) and the whole gently stirred, the sugar gradually disappears from view. It has dissolved. In other words, the cup now holds a *solution* of sugar; the two substances have together formed a homogeneous mixture. If sufficient sugar is added a point will be reached when no more

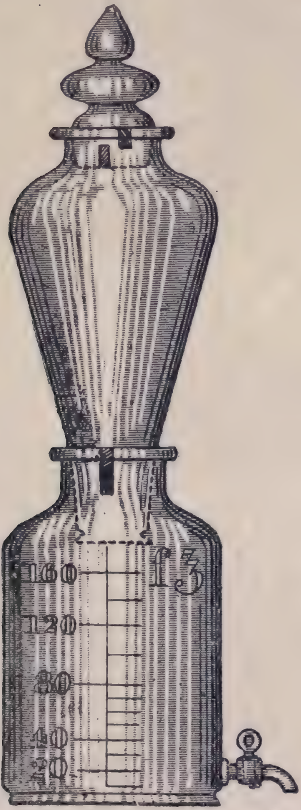

FIG. 30.—YORK GLASS CO.'S PERCOLATOR.

sugar dissolves. The solution is then said to be *saturated*. The point of saturation is mainly dependent on the temperature. The general rule is that 'solubility increases with temperature,' so that the hotter the solvent the larger the amount of solid it will take into solution; but it must be remembered that as the solution cools the excess will be thrown out of solution—usually in the form of crystals.

There are well-known exceptions to this rule: thus the solubility of common salt (sodium chloride) in water is almost unaffected by a rise in temperature, whilst slaked lime (calcium hydroxide) is more soluble in cold water than in hot.

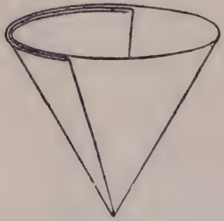

FIG. 31.

Filtration is the process by which liquids are separated from solid particles held in suspension. In some cases the clear liquid that runs through the filter, the *filtrate*, is the objective; in others, the substance left behind. Various materials are employed as filtering media, the most common being unsized paper, cotton and linen fabrics, flannel, felt, cotton-wool, &c.

The simplest application of filtration in pharmacy is the removal of suspended matter from aqueous and alcoholic solutions. This is generally accomplished on a small scale by folding a circular piece of fine *unsized* paper across its diameter, then again at right angles, and opening it out in the form of a hollow cone (fig. 31); this is then placed in a funnel and the liquid to be filtered poured gently in, care being taken that the stream is directed against the side, and not on the unsupported apex of the filter. Frequently, however, filtration proceeds very slowly, owing either to the faulty shape of the funnel, or to the filtering-paper lying too closely against the side.

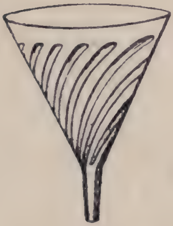

FIG. 32.—FUNNEL, SHOWING SPIRALS.

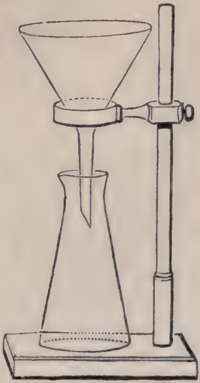

FIG. 33.—FUNNEL-SUPPORT.

All funnels should be ribbed or fluted inside to facilitate the flow of the filtrate. The projections, however, are rarely prominent enough. To be of any service they should be in comparatively high relief, as shown in fig. 32. It is an advantage if the funnels are made with a projection on the outside of the stem, thus permitting the displaced air to escape when filtering into narrow-necked vessels. To avoid splitting the necks of these it is frequently necessary to use funnel-supports, as fig. 33. These may be made of wood or iron, but in either case the foot should be sufficiently massive to afford stability.

Funnels of small size are usually made of glass or earthenware, large sizes of tinned iron or tinned copper. Aluminium funnels specially recommend themselves to the pharmacist on account of their lightness.

The most delicate portion of a paper filter is the apex and it is here that rupture generally occurs, but support may be obtained from a filtering-cone pierced with holes placed in the throat of the funnel.

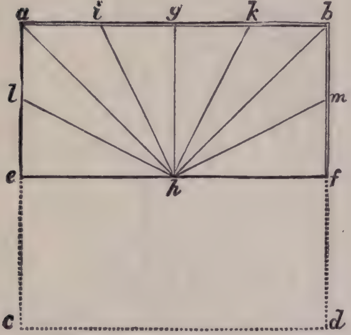

Fig. 34.

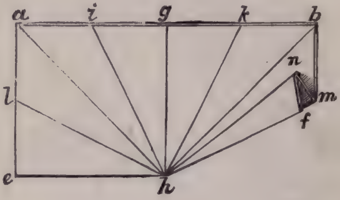

Fig. 35.

Up to now plain paper filters have alone been considered, but, on account of the slowness with which they filter, they are rarely used except for collecting a precipitate without regard to the filtrate, in which case the fewer the folds the more easily the precipitate is detached from the paper. Liquids pass through a pleated filter-paper more quickly than through a plain one. The method of folding is explained by the aid of the following diagrams.

A square piece of paper (*a b c d*, fig. 34) is folded in the line *e f*, the edge *c d* being placed over *a b*. This double sheet is then creased as represented in the drawing. In the first place the crease *g h* is produced by laying *b f* over *a e* and pressing the thumb-nail over the folded edge so as to produce a sharp crease. Then placing *f* over *g*, the crease *b h* is formed; in like manner the crease *a h* is formed by laying *e* over *g*, and by similar means the intermediate creases *l*, *m*, *i*, and *k*. These creases are all in one direction, forming seven angles, and in making them it is desirable not to bring the creases quite to the point *h*, but to leave about half an inch or less through which they do not pass, otherwise the frequent foldings of the paper at this point

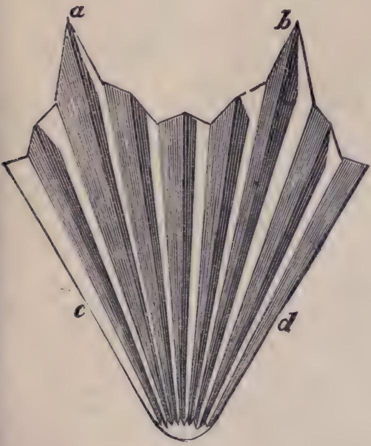

FIG. 36.

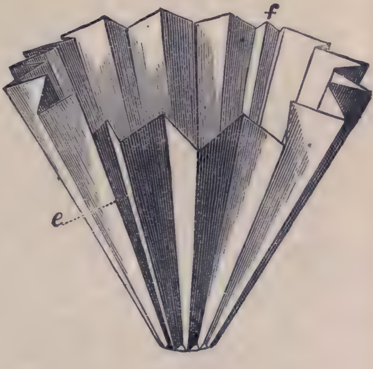

FIG. 37.

will weaken it. In the next place, an equal number of creases are to be made in the opposite direction, bisecting each of the eight sections represented in the upper part of fig. 34. In doing this the edge *f h* is laid on the crease *b h*, and then turned back as shown in fig. 35, producing the crease *n h*. In like manner an intermediate crease is made in each of the other sections, so as to form a fan, as represented in fig. 36. The points *a b* are cut off with scissors, and the filter opened to its proper angle by separating the originally doubled halves of the paper without disturbing the sharpness of the creases. It will now be found to consist of alternately projecting and receding angles, forming a uniform zigzag circumference excepting at the points *c* and *d* (fig. 36), at each of which place two projecting angles come together. The intermediate portion of paper between these two angles should be folded so as to form a

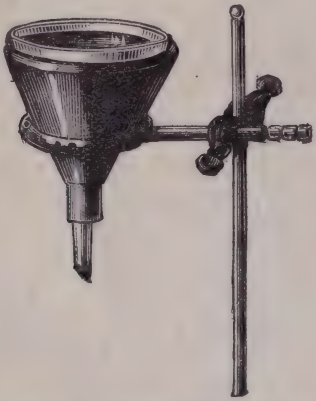

FIG. 38.—HOT-WATER FUNNEL WITH GAS-RING.

small receding angle, as shown at *e* and *f* (fig. 37). This figure represents the appearance of a completed filter.

Hot filtration is occasionally resorted to for the clarification of liquids, such as syrups, glycerins, fats, &c., which are viscous or solid at normal temperatures. The material should be warmed until quite fluid, and then poured on to a paper filter in a funnel kept warm by a contrivance similar to that illustrated in fig. 38.

In this the funnel is fitted into a somewhat large metal funnel by means of a cork in the stem, the jacket thus made being filled with water, which is kept hot by means of the ring of gas-jets. Another simple device for keeping a funnel warm is to wind round it a coil of lead piping, through which steam generated in a tin can over a burner may be forced. The steam should enter at the top of the coil, the lower end dipping into a vessel of water to assist condensation.

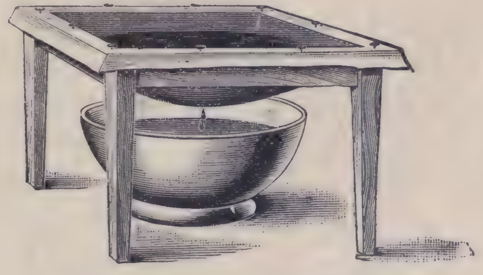

FIG. 39.—STRAINING-FRAME.

Colation.—Colation, or straining, differs from filtration in that it is made use of for the removal of particles of comparatively large size. The ordinary straining-materials are muslin, calico, flannel, felt, horse-hair, etc. A useful support or frame is shown in fig. 39. Muslin and calico may be stretched and adapted for straining small quantities of liquids by means of a metal strainer (fig. 40). For many purposes it suffices to place the straining-cloth in an ordinary funnel in the same way as a filter-paper, when, if the liquid passes through slowly, the four corners may be tied together with a piece of string, and the whole suspended from a nail or hook at a convenient height above the receiver, in a similar manner to the straining-bag (fig. 41). *Gamgee tissue,* which consists of cotton-wool between facings of muslin, makes an excellent straining medium for many purposes.

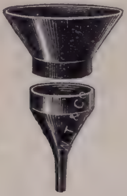

Fig. 40.—Straining-funnel for Muslin or Flannel.

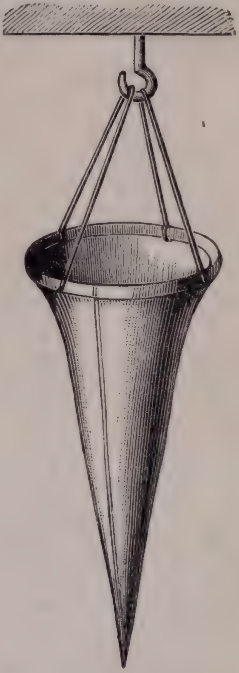

Fig. 41.—Straining-bag.

GENERAL REMARKS ON DISPENSING

Pharmacy.—The preparation of medicines in the general sense constitutes the practice of pharmacy.

Dispensing is that part of pharmacy which, commencing with chemical substances, and such preparations as tinctures, syrups, infusions, etc., embraces the art of compounding them in accordance with the physician's prescription for the immediate use of the patient.

Chemicals are bodies which possess a definite constitution. Sodium chloride, for example, always consists of the elements sodium and chlorine in the proportions 23 and 35·5.

Galenicals are preparations of crude drugs of vegetable or animal origin. The drugs are subjected to various processes, the resulting preparations being confections, decoctions, infusions, syrups, tinctures, etc.

In a well-ordered pharmacy, when a fresh prescription is handed in, a fair copy is first made in the prescription-book, and the prescription itself marked for future reference. The practice of employing a large stamp for this purpose is to be deprecated, as it may possibly obliterate a not too well-defined ingredient or quantity. Indeed, many physicians head their note-paper with a request to place the reference number or stamp on the back of the prescription, and it is to be regretted that the practice has not become general.

The numbering of prescriptions is best performed by an automatic contrivance, as fig. 42. Such machines print the numbers in clear and legible characters, the change of figures being entirely automatic.

In addition to marking the prescription with a reference number, it is customary to indicate the price. For this purpose a cypher is usually adopted. Any word of ten letters will do, provided it contains no duplicate letters. Some pharmacists use a word containing nine letters only; in that case the tenth is supplied by a sign, as X.

Thus:

FLOR. ANTHEM. CHEMISTRYX
1 2 3 4 5 6 7 8 9 10. 1 2 3 4 5 6 7 8 9 10.

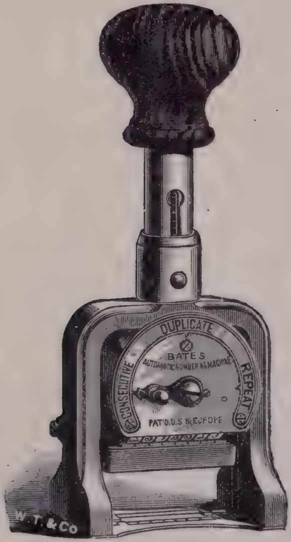

FIG. 42.—AUTOMATIC NUMBERING-MACHINE FOR PRESCRIPTIONS.

Other words are *volumetric, mind the fox, duplicates.* Adopting Flor. Anthem. as the cypher, a mixture priced 2*s*. 6*d*. would be marked *l/n*.

The letters *V. E.* occasionally appear on the side of the prescription, and are abbreviations of the Latin *vide exemplum.* This mark is made when the dispensing of the prescription presents some peculiarity, and directs attention to the copy in the prescription-book, where an explanation is given.

Physicians sometimes write *P. P.* at the top of the prescription, thereby indicating that the patient is a 'poor person,' to whom it is an act of charity to charge less than the usual rates.

Having copied the prescription and carefully considered the ingredients, their compatibility, dose, &c., the labels should next be written in a neat and legible manner. Due attention must be paid to the spacing, as a label may be written accurately and clearly and yet not present a good appearance, owing to some of the words being immoderately drawn out or crowded together. The labels themselves should be on white paper, as neat and plain as possible, and without ornamentation.

While on the subject of prescriptions, it may be as well to mention that should an error in dosage or serious incompatibility be detected in a prescription, it becomes the duty of the dispenser to communicate with the prescriber. This, if possible, should be done without calling the attention of the patient to the fact. If the prescriber lives within a short distance, it is easy to say that the medicine will take a little time to make up, and induce the patient to wait or to call again; but if this course is not open, there may remain no alternative but to explain the matter. With a little tact this may often be done without alarming the patient, but in any case the pharmacist must act with the greatest circumspection.

Some medical men, when writing a prescription, give quantities for one dose only, leaving it to the dispenser to make the necessary calculations. Thus—

℞ Sp. Chloroformi (Spirit of Chloroform). . ♏x.
Tr. Digitalis (Tincture of Digitalis) . . ♏viij.
Inf. Calumbæ ad (Infusion of Calumba to) . ʒiv.
T. d. s. Mitte ℥iv.

Here eight times the prescribed quantities must be taken, made up to four fluid ounces, and labelled 'One tablespoonful to be taken three times a day.'

Bottles and Labels

Mixtures.—Mixtures intended for internal administration may be sent out in flat or oval bottles. The upper edge of the label should come to within half an inch of the shoulder. If it is necessary to affix a 'shake the bottle' label, it should be placed *above* the directions label, for the reason that careless people frequently tear back the wrapping-paper only sufficiently to read the directions, so that any label placed near the base of the bottle is not observed. When any of the ingredients happen to be more than usually potent, as the solutions of strychnine, arsenic, &c., the words '*by measure glass*' may be introduced into the body of the directions, thus: *One tablespoonful* (*by measure glass*) *every four hours.*

When the dose is less than a teaspoonful such mixtures are termed 'drops.' Of late years the practice of sending out mixtures in bottles purporting to be divided into an equal number of parts has become very prevalent. A properly divided bottle saves trouble in measuring the doses, and as long as the practice is confined to the division in ounces, or even tablespoons, no great harm is likely to ensue. It is, however, unreasonable to expect 3-oz. or 4-oz. bottles to be graduated in teaspoons with anything approaching accuracy.

Gargles.—Gargles, although intended for internal use, cannot always be swallowed with impunity, and for distinction may be dispensed in amber-coloured bottles. The same applies to spray solutions for the throat and nose. The label should be plainly headed 'The Gargle,' and may be printed on grey or blue-toned paper.

Lotions.—Eye-lotions and other moderately harmless external applications are best sent out in *green fluted* flat bottles. A '*not to be taken*' label must always be attached. If the lotion is of a distinctly poisonous nature, such as Goulard's extract, a *deep blue fluted* bottle should be selected, and labelled with the word 'Poison.'

Liniments.—Liniments and poisonous applications generally must be dispensed in *deep blue fluted* bottles of hexagonal or other distinctive shape. The shape is of the greatest importance, as such bottles can be readily distinguished in the dark by the touch.

After dispensing the medicines ordered, the prescription should be carefully re-read and the labels checked. When making up old and perhaps familiar forms, the memory must not be relied upon, but the prescription or copy should always be open before the dispenser. Although the memory is not to be trusted when compounding prescriptions and manufacturing preparations, it is absolutely imperative for the dispenser to be familiar with the ordinary and maximum doses of all important medicines, as well as the proportion of active ingredients in their official preparations. It is of little moment, for instance, in dispensing Pulv. Opii Comp. (compound powder of opium), to remember the amount of *ginger* contained in five grains of the powder, but *it is necessary* to realise that *one-tenth* of the weight consists of *opium.*

Habits of neatness must be cultivated. To this end the littering of the bench with bottles, books, or apparatus should be avoided, each article being replaced or put away as soon as done with. Before removing a bottle from the shelf let the label be carefully read. The habit of taking bottles from accustomed places without looking at the label is most dangerous. Indeed, in many pharmacies and dispensaries a rule is made of *slightly* altering the arrangement of the bottles every morning, with the view to discouraging the practice.

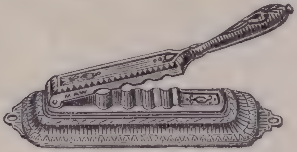

FIG. 43.—LEVER CORK-PRESS.

Moistening corks with the lips, licking labels, &c., are objectionable habits. If too large, the cork should be softened by squeezing in a cork-press, as fig. 43 or fig. 44. The disadvantage of the lever press is that unless used with judgment it frequently breaks the corks. The rotary cork-press is a distinct improvement. In many pharmacies cork-presses are not used, the dispensers preferring to roll the cork beneath a small block of stone or wood.

Label-dampers may take the form shown in fig. 45. Ready-gummed labels, however, are not an unmixed blessing, and many pharmacists prefer to affix their labels with paste. A good adhesive is prepared as follows:

Dextrin	1 lb.
Distilled water	1¼ pint

Mix evenly; dissolve by heat, making up loss by evaporation; cool and add—

Oil of cloves	1 fl. drachm

Pour into jars and allow to set. This takes from twenty-four to seventy-two hours, but the result is excellent.

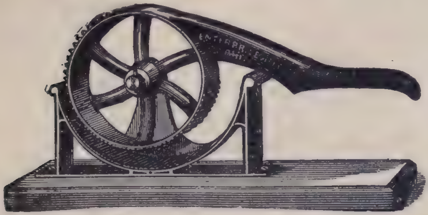
FIG. 44.—ROTARY CORK-PRESS.

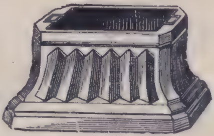
FIG. 45.—LABEL-DAMPER.

THE PRESCRIPTION

Prescription (*præscripto—præ*, before, and *scribo*, I write) is the term applied to the written formula and directions of a physician for the preparation and use of remedies.

A prescription may be divided into four parts: the heading, the designation of the ingredients, the direction to the compounder, and the direction to the patient. In addition, every prescription should bear both the name of the patient and the date, and for reference in case of emergency the name and address of the prescriber.

In ancient times every prescription or formula had at its commencement certain characters or sentences of a pious or superstitious nature, such as + (the sign of the Cross); α and ω (the first and last letters of the Greek alphabet), Christ being designated the 'Alpha and Omega, the beginning and the ending'; C.D., *cum Deo*; J.D., *juvante Deo*; L.D., *laus Deo*; N.D., *nomine Dei*, &c. These constituted the *invocation*, or, as it was called, the *inscription*.

The heading.—The symbol ℞, or abbreviated *Rec.* (*recipe*, take thou), usually commences every formula, but in French prescriptions the letter P. or the word *Prenez*, take, is generally substituted.

The designation of the ingredients.—Each ingredient should have a separate line. It is customary to write the names of the ingredients in Latin; the quantities should be expressed in apothecaries' weights and measures, the numbers being stated in Roman figures. To minimise the chance of error, every unit should have a dot placed immediately above it, thus: xii, viii. If metric weights and measures are designated, the greatest care should be observed in making the position of the decimal point plain: thus, 1 gramme, 1·00; 1 decigramme, 0·1; 1 centigramme, 0·01; 1 milligramme, 0·001. When potent remedies are ordered it is safer to write out the quantity in full, thus:

℞ Strychninæ (Strychnine) . . 50 milligrammes
Sacch. Lact. (Sugar of milk) . q. s.

Make a mass, and divide into thirty pills. One twice a day.

The direction to the compounder as to the manner, form, or method of use of the medicine, constitutes what was originally known as the *subscription*, and is generally written in Latin, as 'Misce,' 'Fiat pilula,' &c.

The direction to the patient declares the dose and time of administration if the medicine is intended for internal use, and the method of application if intended for outward use. It is sometimes preceded by the letter S. (*signetur,* let it be entitled). This part of the prescription should invariably be written in English.

There are several reasons for employing Latin in preference to the vernacular in prescriptions, at least for the designation of the ingredients. Latin, if not spoken, is written and understood throughout the civilised world; moreover, Latin professional terms are concise and definite; and, further, the Latin names for drugs and chemicals are nearly the same all over Europe, whereas the vernacular names differ for each nation and sometimes for each province. Lastly, it is occasionally necessary or advisable to conceal from a patient the precise nature of the remedies employed. On the other hand, these reasons do not apply to the use of the Latin language for writing the *directions to the patient.* There are several objections, such as inability to give in good and intelligible Latin the requisite directions to the patient, and the limited acquaintance with Latin possessed by some dispensers.

The signs used in prescriptions.—Formerly the signs or symbols employed in chemistry and pharmacy as substitutes for words were numerous. At the present time they are very few. The following alone deserve notice:

℞	*Recipe,* take thou. Ancient authors use the sign ♃, being the old invocation to Jupiter.
♏	*Minimum,* the one-sixtieth part of a fluid drachm.
Gtt.	*Gutta,* a drop.
gr.	*Granum,* a grain.

℈	*Scrupulus* or *scrupulum*, a scruple, equal to twenty grains.
ʒ	*Drachma*, a drachm, equal to three scruples, or in liquids the eighth part of a fluid ounce.
℥	*Uncia*, an ounce apothecaries', or in liquids the twentieth part of an imperial pint.
O.	*Octarius*, a pint.

The rules for the grammatical construction of a prescription would be out of place here, and the reader is referred to the excellent 'Latin Grammar of Pharmacy,' by the late Joseph Ince, and to Bennett's 'Medical and Pharmaceutical Latin.'

An explanation of a prescription written entirely in Latin may be useful.

℞ (1) Ferri Carbonatis . . . . . ʒiss.
(2) Rhei Pulveris . . . . . gr. xv.
(3) Conservæ Rosæ, quantum sufficiat, ut fiat massa in pilulas viginti dividenda, quarum sumat æger tres octavis horis.

(1) *Recipe*, verb active, imperative mood, second person singular, agreeing with *tu* (understood); governs the accusative case.
drachmam, noun substantive, accusative singular, feminine, first declension, governed by *recipe*.
unam, adjectival numeral, accusative singular, feminine, agreeing with *drachmam*.
cum, preposition, governing ablative.
semisse, substantive, ablative case, governed by *cum*.
Carbonatis, substantive, genitive singular, masculine, third declension, governed by *drachmam*.
Ferri, substantive, genitive singular, neuter, second declension, governed by *carbonatis*.

(2) *Recipe* (understood).
grana, substantive, accusative plural, neuter, second declension, governed by *recipe*.
quindecim, adjective, indeclinable.

Pulveris, substantive, genitive singular, masculine, third declension, governed by *grana*.

Rhei, substantive, genitive singular, neuter, second declension governed by *pulveris*.

(3) *Recipe* (understood).

quantum, adverb, governing the genitive.

sufficiat, verb impersonal, potential mood, present tense, active, third conjugation.

Conservæ, substantive, genitive singular, feminine, first declension, governed by *quantum*.

Rosæ, substantive, genitive singular, feminine, first declension, governed by *conservæ*.

ut, conjunction, governing subjunctive mood.

massa, substantive, nominative case, feminine, first declension.

fiat, verb, subjunctive, present tense, third person singular, governed by *ut*, and agreeing with its nominative *massa*.

dividenda, gerundive, nominative case, feminine, agreeing with *massa*.

in, preposition, governing accusative.

pilulas, substantive, accusative plural, feminine, first declension, governed by *in*.

viginti, adjective, indeclinable.

quarum, relative pronoun, genitive plural, feminine, agrees with its antecedent *pilulas* in number, gender, and person; governed in the genitive case by *tres*.

æger, adjective, masculine gender, nominative, agreeing with *homo* (understood).

sumat, verb, third period singular, subjunctive, active, third conjugation, agreeing with *homo* (understood).

tres, adjective, accusative plural, feminine, agreeing with *pilulas* (understood).

horis, substantive, ablative plural, feminine, first declension, signifying part of time, and therefore put in the ablative case.

octavis, adjective, ablative plural, feminine, agreeing with *horis*.

LATIN TERMS USED IN PRESCRIPTIONS, WITH THE MORE COMMONLY OCCURRING ABBREVIATIONS

Latin	*Contracted form*	*English*
A, ab, abs	a	by or from
Acetum	acet.	vinegar

Latin	*Contracted form*	*English*
Acidum	acid. ac.	acid
Ad		to, up to
Adde	ad.	add
Adeps		lard
Ad libitum	ad lib.	at pleasure
Admove	admov.	apply
Æger, ægra	æg.	the patient
Agitata phiala	agitat. phiala	the bottle being shaken
Alter	alt.	the other
Alternis horis	alter. horis	every other hour
Amplus	amp.	full, large
Ampulla	amp.	a large bottle
Ana	a., aa., āā	of each
Ante	ant.	before
Aperiens	aper.	aperient
Aqua bulliens	aq. bull.	boiling water
Aqua destillata	aq. dest.	distilled water
Aqua fervens	aq. ferv.	boiling water
Auris		the ear
Balneum	baln.	a bath
Balneum tepidum		a warm bath
Bis	b.	twice
Bis in die	b. i. d.	twice a day
Bulliens	bull.	boiling
Calefactus	calef.	warmed
Calidus	calid.	warm
Calor		heat
Cape	cap.	take (thou)
Capiat	cap.	let him take
Capillus		a hair
Capsula		a capsule
Caput		the head
Cataplasma	catap.	a poultice
Ceratum	cerat.	a cerate
Cibus	cib.	food
Circa	circ.	around
Cochleare	coch.	a spoon
Cochleare amplum	coch. amp.	a tablespoon
Cochleare magnum	coch. mag.	a tablespoon

Latin	*Contracted form*	*English*
Cochleare minimum	coch. min.	a teaspoon
Cochleare parvum	coch. parv.	a teaspoon
Cochleatim	cochleat.	by spoonfuls
Colatur	colat.	let it be strained
Colatus	colat.	strained
Collutorium	collut.	a mouth-wash
Collyrium	collyr.	an eye-wash
Compositus	comp.	compound
Concisus	concis.	sliced
Confectio	conf.	a confection
Congius	cong., C.	a gallon
Contusus	cont.	bruised
Coque	coq.	boil (thou)
Cortex	cort.	bark
Cras	cr.	to-morrow
Cras mane sumendus	c. m. s.	to be taken to-morrow [morning
Cras nocte	c. n.	to-morrow night
Cras vespere sumendus	c. v. s.	to be taken to-morrow [evening
Cujus	cuj.	of which
Cum	c̄	with
Cyathus	cyath.	a cup, wineglass
Cyathus vinarius	cy. vinar.	a wineglass
Decanta	decant.	pour off
Decem		ten
Decoctum	dec.	a decoction
Dens		a tooth
Dexter		the right side
Diebus alternis	dieb. alt.	every other day
Diebus tertiis	dieb. ter.	every third day
Dies	d.	a day
Dilutus	dil.	diluted
Dimidium	dimid.	half
Dividatur in partes æquales	divid. in p. æq.	let it be divided into equal parts
Dosis	dos.	a dose
Drachma	dr.	a drachm
Duo		two
Duplex	dup., dx.	double
E, ex		out of, from

Latin	*Contracted form*	*English*
Eadem	ead.	the same
Ejusdem	ejus.	of the same
Electuarium	elect.	an electuary
Emeticum	emet.	an emetic
Emplastrum	emp.	a plaster
Ex tempore		at the time
Extende	extend.	spread
Extractum	ext.	an extract
Fac	f.	make (thou)
Facies		the face
Fervens	ferv.	boiling
Fiat	ft.	let it be made
Fiat haustus	ft. hst.	let a draught be made
Fiat mistura	ft. mist.	let a mixture be made
Fiat pilula	ft. pil.	let a pill be made
Fiat secundum artem	ft. s. a.	let it be made according to art
Folium	fol.	a leaf
Fortis	fort.	strong
Fotus		a fomentation
Frigidus	frigid.	cold
Fuscus	fusc.	brown
Gallicus	Gall.	French
Gargarisma	garg.	a gargle
Granum	gr.	a grain
Gummi	gum.	a gum
Gutta	gutt., gtt.	a drop
Guttatim	guttat.	drop by drop
Haustus	hst.	a draught
Hirudo	hirud.	a leech
Hodie		to-day
Hora	hor.	an hour
Horâ somni	h. s.	at bedtime
Idem	id	the same
In		into, in
Incisus	incis.	cut, sliced
Indies		daily
Infusum	Inf.	an infusion

Latin	*Contracted form*	*English*
Injectio	Inj.	an injection
Inspissare	insp.	to thicken, inspissate
Inter		between
Intime	intim.	intimately
Jentaculum	jentac.	breakfast
Lac		milk
Lamella		a disc
Laxativus	laxat.	a laxative
Libra	lb.	a pound
Lignum	lig.	wood
Linimentum	lin.	a liniment
Liquor	liq.	a solution
Lotio	lot.	a lotion
Macerare	mac.	to macerate
Mane	m.	in the morning
Massa	m.	a mass
Medicamentum	med.	a drug
Mensura	mens.	by measure
Minimum	min., m.	a minim
Misce	m.	mix (thou)
Misce bene	m. b.	mix well
Mistura	mist.	a mixture
Mitis		mild
Mitte	mit.	send (thou)
Mollis	moll.	soft
More dictu	m. dict.	in the way directed
More solito	mor. sol.	in the usual manner
Mucilago	mucil.	mucilage
Nocte	noct.	at night
Non repetatur	non rep.	do not repeat
Numero	no.	in number
Octarius	oct., O.	a pint
Oculus	oc.	the eye
Oleum	ol.	oil
Omni bihorio	om. bihor.	every two hours

Latin	*Contracted form*	*English*
Omnibus alternis horis	om. alt. hor.	every other hour
Omni hora	om. h.	every hour
Omni mane	om. m.	every morning
Omni nocte	om. n.	every night
Omni quadrante horæ	om. quad. hor.	every quarter of an hour
Omnis	om.	all
Ovi vitellum		yolk of egg
Ovum		egg
Pars		a part
Partem affectam	part. aff.	the affected part
Partem dolentem	part. dol.	the painful part
Partes æquales	p. æq.	equal parts
Partitis vicibus	part. vic.	in divided doses
Parvulus	parv.	small
Pastillus	past.	a pastille
Per		through, by
Pharmacopœia Britannica	Ph. B.	The British Pharmacopœia
Pilula	pil.	a pill
Ponderosus	pond.	heavy
Postea	post.	afterwards
Post jentaculum	p. jent.	after breakfast
Post meridiem	p. mer.	the afternoon
Post prandium	p. prand.	after dinner
Pro re natâ	p. r. n.	occasionally
Pulvis	pulv.	a powder
Quantum	q. quant.	as much
Quantum libet	q. lib.	as much as desired
Quantum sufficiat	q. s.	a sufficiency
Quâque	qq.	each, every
Quâque quartâ horâ	q. q. hor.	every four hours
Quartus	quart.	the fourth
Quater	quat.	four times
Quaterve	quat.	four times
Quinquies	quinq.	five times
Quotidie	quotid.	daily
Radix	rad.	root
Recipe	℞	take (thou)

Latin	*Contracted form*	*English*
Repetatur	rep.	let it be repeated
Sæpe		often
Secundum artem	s. a.	according to art
Semel		once
Semidrachma	semidr.	half a drachm
Semihora	semih.	half an hour
Semis	ss.	half
Si		if
Signatura	signat.	a label
Signe	sig.	write (thou)
Simul	sim., s.	together
Sine	s.	without
Si opus sit	s. o. s.	if there be occasion
Solve	solv.	dissolve
Somnus	somn.	sleep
Spiritus	sp.	spirit
Spiritus vini rectificatus	s. v. r.	rectified spirit
Spiritus vini tenuior	s. v. t.	proof spirit
Statim	st.	at once, immediately
Stet	st.	let it stand
Succus	succ.	juice
Sufficiens	suff.	sufficient
Sumat	sum.	let him take
Sumatur	sum.	let it be taken
Sume	sum.	take (thou)
Sumendus	sum.	to be taken
Super	sup.	upon
Suppositorium	suppos.	suppository
Syrupus	syr.	syrup
Tabella	tab.	tablet
Tempori dextro	temp. dext.	to the right temple
Ter	t.	thrice, three times
Ter in die	t. i. d.	thrice daily
Tinctura	tr.	a tincture
Trochiscus	troch.	a lozenge
Tussis	tus.	a cough
Uncia	unc.	an ounce

Latin	*Contracted form*	*English*
Unguentum	ung.	ointment
Ut dictum	ut dict.	as directed
Utendus	ut.	To be used.
Vel	v.	or
Vesper	vesp.	the evening
Vinum	vin.	wine
Vitellus	vit.	yolk
Vomitus	vomit.	vomiting

Examples of Prescriptions written in a contracted form with the English rendering.

Medical men employ many abbreviations when writing a prescription, especially for the directions. The following are common examples:

℞ Tr. Card. Co. . . ʒij. Sodii Bicarb. . . ʒiij. Sp. Ammon. Arom. . ʒj. Aq. Dest. ad . . ℥vj. ℥j. t. d. s. (℥j. *ter die sumendus.*)	Take of— Compound Tincture of Cardamoms, two fl. drachms. Sodium Bicarbonate, three drachms. Sal Volatile, one fl. drachm. Distilled water to make six fl. ounces. (Two tablespoonfuls to be taken three times a day.)
℞ Mag. Carb. Pond. . ʒij. P. Rhei. . . . ʒiss. Mag. Sulph. . . ʒiv. Aq. M. Pip. ad. . . ℥viij. ℥ss. p. r. n. (℥ss. *pro re natâ.*)	Take of— Heavy Carbonate of Magnesia, two drachms. Powdered Rhubarb, one and a half drachms. Magnesium Sulphate, four drachms. Peppermint water to make eight fl. ounces. (One tablespoonful to be taken occasionally.)

℞ P. Opii . . . gr. j Ft. pil. Mitte vj. j. s. o. s. (*Fiat pilula. Mitte vj. j. si. opus sit.*)	Take of— Powdered Opium, one grain. (Make a pill. Send six. One to be taken when necessary.)
℞ Tr. Bellad. . . ʒss. Sp. Ammon. Arom. . ʒj. Sp. Chlorof. . . ♏xl. Inf. Gent. Co. ad . ℥vj. ʒiv. bis die sum. ex aq. (*ʒiv. bis die sumendus ex aquá.*)	Take of— Tincture of Belladonna, half fl. drachm. Sal Volatile, one fl. drachm. Spirit of Chloroform, forty minims. Compound Infusion of Gentian to make six fl. ounces. (One tablespoonful to be taken twice a day in water.)
℞ Potas. Chlorat. . . ʒj. Ac. Hydroch. Dil. . ʒj. Aq. ad . . . ℥viij. M. ft. garg. S. u. (*Misce fiat gargarisma. Sæpe utendus.*)	Take of— Potassium Chlorate, one drachm. Diluted Hydrochloric Acid, one fl. drachm. Water (distilled) to make eight fl. ounces. (Make a gargle. To be used frequently.)
℞ Chloral Hyd. . . gr. xx. Pot. Brom. . . gr. xxx. Aq. Chlorof. ad . . ℥iss. Ft. hst. hac. noct. sumend. (*Fiat haustus hac nocte sumendus.*)	Take of— Chloral Hydrate, twenty grains. Potassium Bromide, thirty grains. Chloroform water to make one and a half fl. ounces. (Make a draught. To be taken to-night.)
℞ Zinc Valer. . . gr. xxxvi. Ext. Gent. . . gr. vj. Ol. Anthem. . . gtt. j. M. et divid. in pil. xij. Cap. j. b. d. (*Misce et divide in pilulas xij. Capiat unam bis die.*)	Take of— Zinc Valerianate, thirty-six grains. Extract of Gentian, six grains. Oil of Chamomile, one drop. (Mix and divide into twelve pills. One to be taken twice a day.)

℞ Pot. Bicarb. . . ℈ij. Liq. Ammon. Acet. . ʒvj. Sp. Æther. Nit. . . ʒiss. Syr. Tolu . . . ℥ss. Aq. Camph. ad . . ℥iv. M. ft. mist. cujus cap. coch. mag. j. 4tis horis. (*Misce fiat mistura cujus capiatur cochleare magnum quartis horis.*)	Take of— Potassium Bicarbonate, two scruples. Solution of Ammonium Acetate, six fl. drachms. Spirit of Nitrous Ether, one and a half fl. drachms. Syrup of Tolu, half fl. ounce. Camphor water to make four fl. ounces. (Make a mixture, of which take one tablespoonful every four hours.)
℞ Ext. Nuc. Vom. . gr. $\frac{1}{4}$ P. Aloes . . . gr. $\frac{1}{2}$ Ext. Hyos. . . . gr. j. Ft. pil. Mitte xij. C. j. o. n. (*Fiat pilula. Mitte xij. Capiatur j. omni nocte.*)	Take of— Extract of Nux Vomica, quarter grain. Powdered Aloes, half grain. Extract of Henbane, one grain. (Make a pill. Send twelve. One to be taken every night.)

MIXTURES

The great advance in therapeutics in recent years has resulted in the introduction of a very large number of remedial agents. These may be presented in mixtures in so many combinations that a detailed description is well-nigh impossible. It is only possible, therefore, in this small work to consider typical examples and to indicate the general rules observed in compounding.

Mixtures may be divided for convenience of discussion into—

(*a*) Simple mixtures.

(*b*) Mixtures containing resinous tinctures or liquid extracts.

(*c*) Mixtures containing insoluble powders.

(*d*) Mixtures containing fats, fixed or volatile oils (emulsions).

(*e*) Mixtures presenting peculiarities.

(*f*) Mixtures containing incompatibles.

(*g*) Explosive combinations.

(*a*) *Simple mixtures.*—The simplest mixture is a solution of one or more salts in distilled water; thus:

℞ Potass. Cit. (Potassium Citrate)	ʒij.
Potass. Bicarb. (Potassium Bicarbonate) . .	ʒij.
Aq. Dest. ad (Distilled Water to) . . .	℥viij.

The salts should be dissolved in sufficient distilled water and strained through a plug of cotton-wool into the bottle, afterwards making up to the quantity. Straining removes the fragments of foreign matter nearly always present in even the cleanest-looking salts. This process cannot, however, be resorted to when the quantity of salt ordered is in excess of the solubility (see Table of Solubilities, pp. 160–162). In such cases the solid material is powdered finely and the mixture made up to the proper bulk. After well shaking the solid material will deposit, when any floating adventitious matter may generally be removed. Under no circumstances should hot water, or hot infusions or decoctions, be used on account of the possibility of salts being taken into solution which might crystallise out again on cooling, in which case no amount of shaking would enable the correct dose to be taken.

The same procedure may be followed in all other cases where medicated waters, infusions, or decoctions are ordered. If any tincture or syrup is included, this should be added to the bottle *just before* making up to quantity :

℞ Sodii Bicarb. (Sodium Bicarbonate)	ʒij.
Tr. Rhei Co. (Compound Tincture of Rhubarb)	ʒiv.
Syr. Aurant. (Syrup of Orange)	ʒiv.
Inf. Cascarillæ ad (Infusion of Cascarilla to)	℥viij.

In all cases where infusions or decoctions are ordered, they should be prepared and allowed to cool before commencing the mixture. If concentrated infusions or decoctions are employed, this rule, of course, does not apply.

Here it might be mentioned that while in ordinary cases medicine-bottles may be taken as really holding the reputed quantity, they are rarely exact. It is therefore important when potent remedies are prescribed that they should be made to the required volume in a graduate unless the capacity of the bottle has been previously checked. Thus :

℞ Tr. Aconiti (Tincture of Aconite)	ʒj.
Tr. Cimicifugæ (Tincture of Cimicifuga)	ʒiss.
Syr. Zingib. (Syrup of Ginger)	ʒiv.
Aq. Chlorof. ad (Chloroform Water to)	℥viij.

In such cases as this it is usual to warn the patient to measure each dose in a graduate, domestic spoons holding such variable quantities.

It will sometimes be found that salts are prescribed in sufficient quantity to throw the essential oils of medicated waters and the chloroform of chloroform water out of solution. At first sight the floating particles may appear like dirt, but on standing the oils will generally rise to the surface, while the chloroform will collect in little beads at the bottom of the bottle. A 'shake the bottle' label must therefore be affixed.

℞ Sodii Sulphat. (Sodium Sulphate)	ʒvj.
Sodii Citrat. (Sodium Citrate)	ʒij.
Aq. Chlorof. ad (Chloroform Water to)	℥vj.

or—

℞ Sodii Bicarb. (Sodium Bicarbonate)	ʒiv.
Sodii Sulph. (Sodium Sulphate)	ʒvj.
Aq. Cinnam. ad (Cinnamon Water to)	℥vj.

If alcohol in the form of a tincture or medicated spirit is ordered, the essential oil or chloroform may not be thrown out of solution.

Many mixtures only keep good for a few days, especially in warm weather. Infusions and decoctions when prescribed as the vehicle are very liable to change. Infusion of digitalis, for instance, only keeps for a few hours in the summer time. The addition of chloroform, in the proportion used for chloroform water, or of enough alcohol to yield about a 10 per cent. solution, will, however, preserve most mixtures for any reasonable period. Medical men, knowing this tendency, generally add some alcohol, usually in the form of a tincture.

When a mixture contains a volatile liquid, as hydrocyanic acid, it should be added *just before* making up to the bulk; thus:

℞ Potass. Bicarb. (Potassium Bicarbonate)	ʒij.
Potass. Bromid. (Potassium Bromide)	ʒiss.
Sp. Ammon. Arom. (Aromatic Spirit of Ammonia)	ʒiss.
Acid. Hydrocy. Dil. (Dilute Hydrocyanic Acid)	♏xl.
Aq. Menth. Pip. ad (Peppermint water to)	℥viij.

(*b*) *Mixtures containing resinous tinctures or liquid extracts.*—If tincture of Indian hemp is added to water it will, unless certain precautions are taken, form into clots which adhere to the side of the bottle, and which cannot be again distributed by any amount of shaking. This is caused by the resinous and oily matter being thrown out of solution owing to the dilution of the alcohol. In such cases it is necessary to add a suspending agent, such as mucilage of acacia or tragacanth, to the mixture. This does not prevent the resin from being thrown out, but each little particle as it leaves the tincture becomes coated with a film of gum, which prevents it from uniting with other particles to form a sticky mass. The resinous matter is, in fact, emulsified. The mucilage must, however, be quite fresh. Old and acid mucilage is useless as a suspending agent. A 'shake the bottle' label must always be attached.

℞	Potass. Bromidi (Potassium Bromide) . .	ʒiij.
	Tr. Cannabis Indicæ (Tincture of Indian Hemp)	ʒiss
	Tr. Aurantii (Tincture of Orange) . . .	ʒij.
	Aq. Dest. ad (Distilled Water to) . . .	℥vj.

The salt is dissolved in most of the water and strained, three fluid drachms of mucilage of acacia added, and mixed. The mixed tinctures are then poured into the solution in such a way as not to touch the side of the bottle; the bottle is inverted once or twice, and filled up to the required volume.

℞	Potass. Iodid. (Potassium Iodide) . . .	ʒij.
	Tr. Guaiaci (Tincture of Guaiacum) . . .	ʒiv.
	Syr. Zingib. (Syrup of Ginger)	ʒiv.
	Inf. Calumbæ ad (Infusion of Calumba to) .	℥vj.

This mixture is treated in a similar manner to the foregoing, six fluid drachms of mucilage being required. Should any difficulty be experienced in emulsifying a resinous tincture or liquid extract on these lines, the mucilage may be mixed with a portion of the water in a graduate and the preparation to be emulsified poured slowly in, stirring meanwhile with a glass rod.

The following mixtures also require the addition of mucilage:

℞	Potass. Chlorat. (Potassium Chlorate)	ʒij.
	Ol. Gaultheriæ (Oil of Gaultheria)	♏viij.
	Tr. Myrrhæ (Tincture of Myrrh)	ʒvj.
	Aq. Chlorof. ad (Chloroform Water to)	℥viij.
	(Mucilage of Acacia ℥j.)	

℞	Ext, Hydrastis Liq. (Liquid Extract of Hydrastis)	ʒiss
	Tr. Bellad. (Tincture of Belladonna)	ʒij.
	Caffein. Cit. (Caffeine Citrate)	gr. xl.
	Tr. Lavand. Co. (Compound Tincture of Lavender)	ʒij
	Inf. Gent. Co. ad (Compd. Infusion of Gentian to)	℥viij.
	(Mucilage of Acacia ʒiv.)	

Tincture of benzoin, although containing a large amount of resinous matter, forms an almost perfect emulsion by itself if poured in a thin stream into a considerable excess of water. If salts are present, however, there is a tendency for the benzoin to be thrown out of solution, in which case it is better to err on the safe side by adding a little mucilage.

The following tinctures require the adding of mucilage to enable them to be properly dispensed:

Tincture of Asafetida
" " Benzoin (Compound)
" " Cannabis
" " Grindelia
" " Jalap
" " Guaiacum
" " Hydrastis
" " Indian Hemp
" " Myrrh
" " Tolu

(*c*) *Mixtures containing insoluble powders.*—Insoluble powders are frequently prescribed in mixtures. When the powder is of low gravity, as calcined magnesia (Magnes. Calc.), rhubarb (Pulvis Rhei), or if it diffuses readily and remains suspended while a dose is measured, the mixture may be dispensed as written, without any addition. In every case a ‘shake the bottle’ label is necessary.

℞	Magnes. Calc. Pond. (Heavy Calcined Magnesia)	ʒij.
	Magnes. Sulphat. (Magnesium Sulphate) . .	ʒvj.
	Sp. Ammon. Arom. (Compound Spirit of Sal Volatile)	ʒij.
	Aq. Menth. Pip. ad (Peppermint Water to) .	℥vj.

The Epsom salt is dissolved in a portion of the water and strained, the magnesia and sal volatile added, the mixture shaken, and made up to volume.

℞	Pulv. Rhei (Powdered Rhubarb) . . .	ʒij.
	Sodii Bicarb. (Sodium Bicarbonate) . . .	ʒij.
	Tr. Card. Co. (Comp. Tincture of Cardamoms) .	ʒiv.
	Aq. Caryoph. ad (Clove Water to) . . .	℥vj.

The two powders are triturated in a mortar, with sufficient clove water to form a thin cream. This is then transfered to the bottle, the mortar being rinsed out with more of the clove water. Then the tincture is added, and the mixture made up to six fluid ounces. It will be noted that the alkali darkens the rhubarb. If at all lumpy, the mixture must be strained through *coarse* muslin.

On the other hand, if the powders are too dense to be easily suspended or are liable to adhere to the bottom and side of the bottle, some thickening agent must be employed. The most useful substances are tragacanth and acacia. Occasionally the prescriber orders the necessary suspending agent, but more frequently leaves it to the judgment of the dispenser.

℞	Bismuth. Subnit. (Bismuth Oxynitrate)	ʒij.
	Tr. Calumbæ (Tincture of Calumba)	ʒiv.
	Sp. Armoraciæ Co. (Compound Spirit of Horse-radish)	ʒiv.
	Syr. Zingib. (Syrup of Ginger)	ʒij.
	Aq. Dest. ad (Distilled Water to)	℥vj.

Triturate the bismuth oxynitrate in a mortar with two fluid ounces of water and transfer to a bottle, using a little more water to rinse out the mortar; add two fluid ounces of tragacanth mucilage and shake; then add the other ingredients and make up. In cases where an infusion or a decoction is ordered it is not permissible to use tragacanth mucilage. Powdered tragacanth is then substituted; thus:

℞	Bismuth. Subcarb. (Bismuth Oxycarbonate)	ʒij.
	Sodii Bicarb. (Sodium Bicarbonate)	ʒiij.
	Pulv. Rhei (Powdered Rhubarb)	ʒj.
	Pulv. Tragacanth. (Powdered Tragacanth)	gr. xij.
	Inf. Calumbæ ad (Infusion of Calumba to).	℥vj.

The tragacanth may be incorporated in either of two ways: (1) All the powders are mixed in a mortar, sufficient infusion to make a cream added *all at once*, and quickly triturated. The thick mixture is then gradually diluted, constantly stirring meanwhile, and made up to volume.

(2) Two fluid drachms of 90 per cent. alcohol are placed in a perfectly dry bottle, the tragacanth is carefully added, and the two gently mixed in the bottom of the bottle. Half the infusion is now added, and the bottle quickly corked and vigorously shaken. The

mucilage thus formed is then used as previously described, the bottle being washed out with the remaining infusion.

When the mixture contains tinctures or other spirituous liquids no additional alcohol is needed.

℞ Bismuth. Subcarb. (Bismuth Oxycarbonate)	ʒiij.
Magnes. Carb. (Magnesium Carbonate)	ʒij.
Tr. Card. Co. (Compound Tincture of Cardamoms)	ʒiv.
Pulv. Tragac. (Powdered Tragacanth)	℈j.
Aq. Chlorof. ad (Chloroform Water to)	℥vj.

Here the powders may be mixed together, and then about half the water stirred in; or the tragacanth may be placed in a dry bottle with the tincture, diluted with half the water, and quickly shaken, proceeding as earlier described.

Were the tragacanth added directly to the water, or *vice versâ*, it would swell up so rapidly as to become unmanageable. By diluting with an inert powder or with alcohol, the grains of tragacanth are separated and a smooth mucilage results. If *compound* tragacanth powder is prescribed, it may be mixed directly with aqueous liquids to form a mucilage, as the tragacanth is already diluted with starch and sugar.

Acacia is not so valuable a suspending agent as tragacanth on account of its tendency to form cement-like compounds with certain substances. Thus, unless ordered, it should not be used for bismuth carbonate or oxynitrate, or with magnesia. In mixtures similar to the following it answers fairly well:

℞ Pulv. Cretæ Arom. (Aromatic Chalk Powder)	ʒij.
Tr. Cinnam. (Tincture of Cinnamon)	ʒij.
Tr. Opii (Tincture of Opium)	ʒss.
Pulv. Acaciæ (Powdered Acacia)	ʒij.
Aq. Dest. ad (Distilled Water to)	℥vj.

The powders are mixed together, an ounce or so of the water added, and the whole triturated to form a smooth cream; then the mixture is gradually diluted with more water, and finished off in the usual manner. In no case is a spirituous liquid added direct to either powdered acacia or acacia mucilage, strong alcohol being a complete precipitant of the gum.

(*d*) *Mixtures containing fats, fixed or volatile oils* (*emulsions*).—In pharmacy the term emulsion is applied to the milk-like mixture formed by the suspension of small globules of fatty or resinous matter in water. If a drop of milk (a natural emulsion) is mounted on a slide and examined under a microscope, it will be seen to consist of a number of globules of fat floating in a clear liquid. Each globule is coated with a thin film of casein, which prevents it from coalescing with others. On standing for some time, a large proportion of the fat rises to the top, constituting cream, but the two layers, while fresh, readily mix on gently shaking. A milk-like emulsion may be artificially produced with oils and fats by treatment with mucilaginous liquids. If cod-liver oil, for instance, is vigorously shaken with two or three times its volume of water, an opaque mixture is formed which requires to rest for some time before separating into distinct layers. If now a small quantity of mucilage of acacia is added and the mixture again shaken the liquid will become milky, and will require to stand for a much longer period before separation again takes place. The reason for this non-separation is the partial emulsification of the oil. When oil is agitated with water it breaks up into a number of globules, which again coalesce when the liquids come to rest; but if mucilage is added, each globule becomes coated with a film which retards coalescence. Experiment has shown that, provided the mixture is sufficiently viscous, the smaller the globules, and the more perfectly they are coated with gum, the more persistent is the resulting emulsion.

The emulsifying agents in general use are acacia, tragacanth, decoction of Irish moss, yolk of egg, malt extract, and soap. Of these, the first five are employed in mixtures for internal use; while yolk of egg and soap are used for liniments and other outward applications.

Acacia.—Gum acacia is used both as a powder and in the form of mucilage. The latter must be freshly made, since it rapidly becomes acid and useless as an emulsifying agent. Generally speaking, one part of acacia will emulsify four fluid parts of any *fixed* oil (olive, almond, castor, cod-liver, &c.), or liquid paraffin, two parts of water being added all at once to produce the primary emulsion.

℞	Ol. Morrhuæ (Cod-liver Oil)	℥iv.
	Pulv. Acaciæ (Powdered Acacia)	℥j.
	Syr. Aurant. (Syrup of Orange)	ʒiv.
	Aq. Cinnam. ad (Cinnamon Water to).	℥viij.

The powder is placed in a dry mortar of the capacity of not less than a pint, and triturated with the oil. Two ounces of the cinnamon water are added all at once and vigorously stirred until a white tacky emulsion is formed. Any unmixed portions are scraped from the side of the mortar and stirring continued for several minutes, the syrup, mixed with the remainder of the water, being added by degrees. If well made, such an emulsion ought not to show any sign of separation even after standing several weeks.

If salts are ordered, they must be previously dissolved in the vehicle. Glycerin, alcohol and syrups are all antagonistic to emulsions, and should always be diluted before adding to an emulsion.

Powdered acacia answers well for emulsifying copaiba and other oleo-resins:

℞	Copaibæ (Copaiba)	ʒvj.
	Tr. Belladon. (Tincture of Belladonna)	ʒj.
	Sp. Æther. Nit. (Spirit of Nitrous Ether)	ʒiij.
	Pulv. Acaciæ (Powdered Acacia)	ʒij.
	Aq. Caryoph. ad (Clove Water to)	℥viij.

In this case it is best to make a very stiff mucilage of the gum with a little of the water, and to stir in the copaiba, added drop by drop. If it becomes too thick, a little water may be incorporated at intervals. The emulsion may then be diluted with constant stirring, the tincture and spirit added, and the whole made up to volume.

The following mixture may be dispensed as written:

℞	Copaibæ (Copaiba)	℥j.
	Liq. Potassæ (Solution of Potash)	℥j.
	Tr. Belladon. (Tincture of Belladonna)	♏lxxx
	Dec. Hordei ad (Decoction of Barley to)	℥viij.

Boil one ounce of pearl barley with about a pint and a half of water for ten minutes, strain, and make up to one pint. Cool. Place about four fluid ounces of the decoction in the bottle, add the solution of potash, and mix. Then pour in the copaiba, shake well, and finish off in the usual manner.

Volatile oils require more gum than fixed oils and even with the most careful manipulation some separation generally takes place on standing. An emulsion should, however, be re-formed on shaking gently.

℞	Ol. Terebinth. (Oil of Turpentine)	ʒij.
	Pulv. Acaciæ (Powdered Acacia)	ʒiss.
	Syr. Tolu (Syrup of Tolu)	ʒij.
	Aq. Anisi ad (Aniseed Water to)	℥iij.

Place the acacia in a dry mortar, add the turpentine and stir well. Then add all at once two fluid drachms of aniseed water and again mix. Then gradually dilute with more aniseed water, finally adding the syrup, diluted with some of the aniseed water.

An emulsion which sometimes causes a little trouble is:

℞	Terebeni (Terebene)	ʒiss.
	Ol. Amygdalæ (Oil of Almond)	ʒiv.
	Tr. Tolu (Tincture of Tolu)	ʒiss.
	Vin. Ipecac. (Ipecacuanha Wine)	ʒj.
	Aq. Anethi ad (Dill Water to)	℥viij.

Place 100 grains of acacia in a dry mortar, with the terebene and almond oil, mix; add, all at once, four drachms of the water, and stir until a thick primary emulsion results. Gradually dilute with dill water to six fluid ounces. Into this pour the tincture of tolu in a thin stream, stirring gently. Add the ipecacuanha wine, and make up to volume.

Tragacanth.—Emulsions of the fixed oils prepared with tragacanth are more or less translucent. Examined under the microscope, the oil globules appear to be relatively large; but, if well prepared, there is not much danger of separation. The following proportions may be used for the rapid production of extemporaneous emulsions :

℞ Ol. Morrhuæ (Cod-liver Oil)	℥iv.
Pulv. Tragac. (Powdered Tragacanth)	gr. xxx.
Sp. Chlorof. (Spirit of Chloroform)	ʒj.
Sodii Hypophosph. (Sodium Hypophosphite)	gr. lxxx.
Aq. Dest. ad. (Distilled Water to)	℥viij.

Place the tragacanth and spirit in a *dry* 16-oz. bottle, shake; add half the water all at once and shake vigorously. Add the oil by degrees, shaking well after each addition. Dilute with the remainder of the water in which the hypophosphite has been dissolved.

Tragacanth may also be employed for the suspension of terebene, volatile oils, &c. It does not produce milky emulsions. In fact, the tendency is towards translucency, but the great viscosity of the swollen tragacanth effectually separates the oil globules.

℞ Ol. Terebinth. (Oil of Turpentine)	ʒiss.
Pulv. Tragac. (Powdered Tragacanth)	gr. x.
Syr. Tolu (Syrup of Tolu)	ʒiv.
Aq. Dest. ad (Distilled Water to)	℥iij.

Introduce the tragacanth into a *dry* vial, add the turpentine, shake, and add, all at once, half the water. Shake vigorously, add the syrup, and make up to volume.

Irish moss.—Irish moss emulsions are perhaps more successful when made in quantities of two or three gallons than when prepared at the dispensing bench. The moss is well washed with cold water to remove impurities, then placed over a water bath with water, heated for about thirty minutes, and strained. The most satisfactory strength for the mucilage is ten grains to each ounce of water. This mucilage, when cold, is capable of emulsifying an equal weight of fixed oil.

℞	Ol. Morrhuæ (Cod-liver Oil)	℥viij.
	Pulv. Acaciæ (Powdered Acacia)	℥j.
	Elixir Glusidi (Elixir of Saccharin)	ʒij.
	Ol. Amygd. Amar. (Oil of Bitter Almonds)	gtt. iv.
	Mucil. Chondri ad (Mucilage of Irish Moss to)	℥xvj.

Place the gum in a dry mortar with the oils, mix. Add, all at once, three fluid ounces of the mucilage and triturate until a strong tacky emulsion results. Dilute this, constantly stirring, with the remainder of the mucilage, to which the elixir has been previously added.

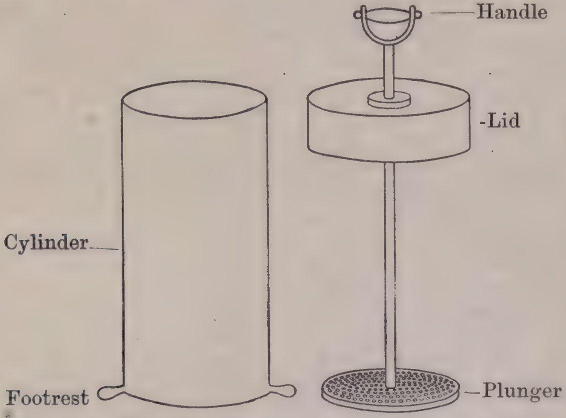

Fig. 46.—Emulsifier.

If it is desired to make several gallons at a time, a simple butter-churn, similar to the one shown in the diagram (fig. 46) may be used. The gum acacia, in the proportions given above, is dissolved in the mucilage, which is placed in the cylinder. The oil is then added by degrees and the piston worked vigorously up and down. As considerable exertion is required the feet are placed firmly on the projections of the cylinder. With each downward stroke the emulsion is driven violently upwards through the holes in the plunger, while on withdrawing the latter, the air-pressure, which, it must be remembered, is equivalent to about 14 lb. to the square inch, forces the mixture back again through the holes. The plunger must, of course, fit accurately in the cylinder. The apparatus should be constructed in well-tinned iron. If brass or copper is used there is danger of the emulsion being coloured, most oils attacking copper very quickly.

Yolk of egg.—The yolk of one egg is sufficient to emulsify four fluid ounces of liquid paraffin or of any fixed oil. The ordinary procedure is to break the shell by a smart blow on the edge of a graduate, separating the yolk as cleanly as possible. After rubbing in a mortar until perfectly smooth, the oil is added by degrees, stirring constantly, a little water being added from time to time to prevent the emulsion from becoming too thick. The finished mixture must always be strained through muslin. Well-made egg-emulsions bear the addition of acids well, excellent examples being the "white oils" so common in rural districts. Yolk of egg is frequently ordered in copaiba emulsions:

℞	Copaibæ (Copaiba)	ʒvj.
	Ol. Santali (Oil of Sandal)	ʒiss.
	Ovi Vitelli (Yolk of Egg)	j.
	Syr. Tolu (Syrup of Tolu)	ʒvj.
	Aq. Cinnam. ad (Cinnamon Water to)	℥vj.

Place the yolk in a mortar and triturate until smooth; add the copaiba and oil alternately, stirring vigorously. If the emulsion becomes too thick, add a little of the water; but it should always be of the consistence of a thick cream until ready for the final dilution. Add the syrup last.

Yolk of egg is nearly always employed for turpentine and acetic acid liniments:

℞	Ol. Terebinth. (Oil of Turpentine)	℥j.
	Ovi Vitelli (Yolk of Egg)	j.
	Acid. Acetic. Dil. ad (Diluted Acetic Acid to)	℥iv.

Place the yolk in a mortar, triturate until smooth, and add the oil and acid alternately, stirring constantly, If the emulsion becomes too thick, add rather more of the diluted acid.

Yolk of egg also makes an excellent emulsion with cod-liver oil, especially when combined with a little tragacanth—

℞	Ol. Morrhuæ (Cod-liver Oil)	℥iv.
	Pulv. Tragac. (Powdered Tragacanth)	gr. x.
	Ovi Vitelli (Yolk of Egg)	j.
	Elixir Glusidi (Elixir of Saccharin)	ʒss.
	Aq. Cinnam. ad (Cinnamon Water to)	℥viij.

Place the tragacanth in a dry mortar, add about one fluid drachm of cod-liver oil, and mix. Then add the yolk of egg, which has been carefully separated from the white, mix, and gradually incorporate more of the oil, about two fluid drachms at a time, with constant stirring. Should the mixture become too thick, add a few drops of cinnamon water occasionally. When all the oil has been added, dilute with the cinnamon water, adding the elixir just before making up.

Soap.—Soft soap is occasionally employed in liniments, the pharmacopœial Linimentum Terebinthinæ forming a good example. It is also prescribed in formulæ similar to the following:

℞	Sapo. Mollis (Soft Soap)	ʒiv.
	Picis Liq. (Stockholm Tar)	ʒiv.
	Spirit. Rect. ad (Rectified Spirit to)	℥iij.

This is dispensed as written, a clear mixture being formed. On pouring into water a milky emulsion of tar results.

Quillaia.—This bark, when extracted with dilute alcohol, yields a tincture which possesses emulsifying properties. In the pharmacopœial Liquor Picis Carbonis a tincture of quillaia is prepared, which is used to extract the soluble matter of the coal-tar. On pouring the clear solution into water, the saponin (which is the emulsifying agent present in the quillaia) prevents the tarry products from separating. Tincture of quillaia is not, however, suitable for the preparation of emulsions for internal use.

(*e*) *Mixtures presenting peculiarities.*

℞	Ammon. Carb. (Ammonium Carbonate)	gr. xxx.
	Oxymel. Scillæ (Honey of Squill)	ʒvj.
	Vin. Ipecac. (Ipecacuanha Wine)	ʒj.
	Aq. Anisi ad (Aniseed Water to)	℥iv.

The correct method of dispensing this mixture is to dissolve the carbonate in the aniseed water and mix it with the acid oxymel in a glass measure, stirring vigorously to promote the disengagement of gas. If mixed in a bottle and corked at once sufficient carbon dioxide will be liberated to cause an explosion.

The following gargle must also be dealt with on similar lines, the boric acid decomposing the carbonate, forming sodium borate and liberating carbon dioxide:

℞	Acid. Boric. (Boric acid)	ʒij.
	Sodii Bicarb. (Sodium Bicarbonate)	ʒij.
	Glycerin. (Glycerin)	ʒiv.
	Aq. Dest. ad (Distilled Water to)	℥viij.

The next mixture is an unsightly one, the ammonia throwing out the alkaloid, although the iron hydroxide remains in solution.

℞ Ferri et Quin. Cit. (Iron and Quinine Citrate)	gr. lxxx
Tr. Card. Co. (Compound Tincture of Cardamoms)	ʒij.
Sp. Ammon. Arom. (Aromatic Spirit of Ammonia)	ʒiss.
Aq. Dest. ad (Distilled Water to)	℥viij.

In this case the scales should be dissolved in the bulk of the water, one ounce of mucilage of tragacanth added, and the mixed tincture and spirit poured in, gently shaken, and made up to bulk.

Another very common so-called explosive mixture is a combination of bismuth oxynitrate (subnitrate) and a carbonate—

℞ Bismuth. Subnit. (Bismuth Oxynitrate)	ʒj.
Sodii Bicarb. (Sodium Bicarbonate)	ʒiss.
Tr. Rhei Co. (Compound Tincture of Rhubarb)	ʒvj.
Aq. Dest. ad (Distilled Water to)	℥vj.

The bismuth salt should be first mixed with the dissolved bicarbonate in a mortar, stirred until effervescence ceases, and then poured into a mixture of mucilage of tragacanth 1 fl. oz., water 2 fl. oz. The tincture is then added, and the whole brought to the correct volume.

A mixture which cannot be dispensed without a precipitate forming, due to the formation of quinine acetate, is as follows:

℞ Quin. Sulph. (Quinine Sulphate)	gr. xxiv.
Sodii Acet. (Sodium Acetate)	ʒiss.
Acid. Hydrochlor. Dil. (Diluted Hydrochloric Acid)	ʒj.
Syr. Aurant. (Syrup of Orange)	ʒiv.
Aq. Dest. ad (Distilled Water to)	℥vj.

Here it is also well to add a suspending agent. The quinine, acid and syrup are dissolved in part of the water, and poured into a mixture of one fluid ounce of mucilage of tragacanth with two of water containing the acetate in solution.

Sodium salicylate always causes a precipitate when added to quinine solutions:

℞ Sodii Salicyl. (Sodium Salicylate)	ʒij.
Quin. Hydrochlor. (Quinine Hydrochloride)	gr. xxiv.
Acid. Sulph. Dil. (Diluted Sulphuric Acid)	ʒiss.
Syr. Zingiberis (Syrup of Ginger)	ʒvj.
Aq. Dest. ad (Distilled Water to)	℥vj.

The quinine, acid and syrup are dissolved in part of the water, and poured into a mixture of one fluid ounce of tragacanth mucilage with two of water in which the salicylate has been previously dissolved.

Bromoform is rather troublesome owing to its insolubility in water and its high specific gravity—

℞ Bromoform (Bromoform)	♏xxx.
Ol. Amygd. (Almond Oil)	ʒiv.
P. Acaciæ (Powdered Acacia)	ʒj.
Aq. Dest. ad (Distilled Water to)	℥iv.

Place the gum in a dry mortar; add the bromoform and oil, and triturate; add, all at once, six fluid drachms of water and stir rapidly. Gradually add the remainder of the water. Add a "shake the bottle" label.

Another method of dispensing bromoform is—

℞ Bromoform (Bromoform)	♏xxxij.
Sp. Rect. (Rectified Spirit)	ʒij.
Glycerin. (Glycerin)	℥j.

Mix. This may be diluted with water as each dose is taken, without the bromoform being thrown out of solution.

Salol.

℞	Salol (Salol)	ʒij.
	Ol. Amygd. (Almond Oil)	ʒiv.
	P. Acaciæ (Powdered Acacia)	ʒij.
	Syr. Aurant. (Syrup of Orange)	ʒiv.
	Aq. Anisi ad (Aniseed Water to)	℥vj.

Melt the salol in a small dish with the oil; pour on to the gum in a warmed dry mortar. Add one ounce of warm water and triturate until a creamy emulsion is produced. Dilute gradually to four ounces, and add the syrup mixed with the remainder of the water.

Balsam of tolu.

℞	Bals. Tolu (Balsam of Tolu)	ʒj.
	Sp. Rect. (Rectified Spirit)	ʒiv.
	P. Acaciæ (Powdered Acacia)	ʒiij.
	Syrupi (Syrup)	ʒiv.
	Aq. Dest. ad (Distilled Water to)	℥iv.

Warm the tolu balsam in a porcelain capsule, add the spirit, and dissolve; strain through muslin into a mortar with the gum, and add, all at once, half an ounce of water; stir briskly until a good emulsion is formed; gradually dilute to two fluid ounces. Add the syrup dissolved in the remainder of the water.

Lanolin.

℞	Adip. Lanæ (Anhydrous Wool Fat)	ʒij.
	P. Saponis (Powdered Soap)	ʒj.
	Aq. Dest. ad (Distilled Water to)	℥iv.

Place the wool fat in a warm mortar, and when melted add the powdered soap; mix and add, all at once, four fluid drachms of *hot* water; triturate briskly, and add the remainder of the water by degrees.

Spermaceti.

℞ Cetacei (Spermaceti)	ʒij.
Ovi Vitelli (Yolk of Egg)	j
Syrupi (Syrup)	ʒiv.
Aq. Dest. ad (Distilled Water to)	℥iv.

Powder the spermaceti with a drop of almond oil, add the syrup, and rub to a perfectly smooth paste. Then triturate with the yolk of egg and dilute gradually with the water.

Cocoa-butter.

℞ Ol. Theobrom. (Cocoa Butter)	ʒj.
Ol. Amygdalæ (Almond Oil)	ʒj.
P. Acaciæ (Powdered Acacia)	ʒj.
Aq. Dest. ad (Distilled Water to)	℥ij.

Make a mortar hot with boiling water. Wipe perfectly dry and introduce the fat; as soon as it melts add the oil and gum, and triturate gently. Then add, all at once, half an ounce of boiling water and stir briskly. Gradually add the remainder of the water (warm).

Extract of male fern.

℞ Ext. Filicis Liq. (Liquid Extract of Male Fern)	♏xx.
Lact. ad (Fresh Milk to)	℥iss.

Place the extract of male fern in a mortar, and gradually incorporate the fresh milk, little by little, with constant stirring.

Extract of male fern may be emulsified by means of mucilage of acacia, using twice as much mucilage as the extract ordered. Mix both together in a mortar, and incorporate the diluent a little at a time, stirring well.

Gum-resins, such as ammoniacum and myrrh, require powdering and moistening with water. Brisk trituration then yields a very good emulsion, which only requires diluting and straining. In this case the natural gum present is sufficient to emulsify the resin without further addition.

Many seeds, such as almonds, under proper treatment, form very good emulsions—

℞	Amygd. Amaræ (Bitter Almond)	ʒiv.
	Acid. Boric. (Boric Acid)	℈j.
	Acid. Carbolic. Liq. (Liquefied Carbolic Acid)	ʒss.
	Aq. Rosæ ad (Rose Water to)	℥vj.

Pour a little boiling water on to the almonds and allow to stand until cool. The brown outer skins may now be removed with the fingers. The almonds must then be powdered as finely as possible, a little water added, and the whole beaten into a stiff paste. Afterwards the boric acid and phenol dissolved in the remainder of the water are added by degrees and the finished lotion strained through muslin.

Chlorine mixtures.—The following prescription for a gargle may not at first sight present any peculiarity:

℞	Potass. Chlorat. (Potassium Chlorate)	gr. xl.
	Acid. Hydrochloric. (Hydrochloric Acid)	ʒss.
	Aq. Dest. Ad (Distilled Water[1] to)	℥viij.

The prescriber intends a gargle to be made containing free chlorine. The chlorate is placed in a dry corked bottle and the acid added. On corking and immersing the bottle in warm water, or heating gently over a small flame, a greenish-coloured gas is evolved, the reaction being completed after a few minutes. A little water is poured in, the bottle again corked and shaken vigorously to dissolve the liberated chlorine, and the whole then made up to volume.

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[1] Distilled water is conveniently kept in glass carboys—say, of the capacity of two gallons—provided with a tap. If the water is kept in an ordinary 'shop-round,' the air displaced in filling another narrow-necked vessel invariably gains access. In many cases this is not of much consequence, but in some instances it may have unlooked-for results. Thus, in making a chlorine gargle, sufficient chlorine may find its way into the water-bottle afterwards to liberate iodine from potassium iodide; or if a bottle containing ammonia is filled up, enough ammonia may be dissolved to precipitate alkaloids from neutral solutions.

Chemical action should as a general rule be retarded. This is best brought about by mixing the active ingredients *well diluted.* The following mixture is an example which well illustrates this point—

℞	Tr. Ferri Perchlor. (Tincture of Perchloride of Iron)	ʒij.
	Glycerin. (Glycerin)	ʒiv.
	Mucil. Acaciæ (Mucilage of Acacia)	℥j.
	Inf. Calumbæ ad (Infusion of Calumba to) . .	℥viij.

If the tincture is added directly to the mucilage, a gelatinous precipitate is formed which cannot again be dissolved. If, however, the tincture is mixed with the glycerin and about half of the infusion, and then poured into the mucilage, previously diluted with the remainder of the infusion, a *clear* brownish-yellow liquid results.

NOTE.—This infusion does not contain any tannin, and is not blackened by the iron. Had gentian been given instead of calumba, a most unsightly turbid mixture would have been formed.

A note will be found in the chapter on 'Incompatibles' to the effect that arsenic should not be prescribed in solution with persalts of iron, on account of the risk of precipitation. The two may, however, be given together under proper conditions. The following is an example :

℞	Liq. Ferri Dialysat. (Solution of Dialysed Iron)	ʒiv.
	Liq. Arsenicalis (Solution of Arsenic, Fowler's)	♏xxxij.
	Aq. Chlorof. ad (Chloroform Water to)	℥viij.

Here again, if the two solutions are mixed, a brown precipitate will form, but if each is well diluted before mixing, a bright mixture results.

Perchloride of iron and phosphoric acid are two favourite preparations, but when prescribed together the result is far from elegant, it being impossible to prevent a separation of ferric phosphate—

℞	Liq. Ferri Perchlor. (Solution of Perchloride of Iron)	ʒiss.
	Acid. Phos. Dil. (Diluted Phosphoric Acid)	ʒij.
	Tr. Calumbæ (Tincture of Calumba)	ʒiv.
	Syr. Flor. Aurant. (Syrup of Orange Flower)	ʒvj.
	Aq. Dest. ad (Distilled Water to)	℥vj.

This is best dispensed as follows: Mix the iron solution with half the water, add the syrup and tincture; shake. Dilute the acid with the remainder of the water and add gradually to the first. The mixture, of course, requires a 'shake the bottle' label.

℞	Phenazon. (Phenazone)	ʒj.
	Quinin. Hydrochlor. (Quinine Hydrochloride)	ʒj.
	Sodii Salicyl. (Sodium Salicylate)	ʒj.
	Aq. ad (Distilled Water to)	℥vj.

Dissolve each separately in an ounce of water, add one fluid drachm of mucilage of acacia to each, and mix in the order named.

℞	Calcii Chlorid. (Calcium Chloride)	ʒij.
	Ext. Glycyrrh. Liq. (Liquid Extract of Liquorice)	℥j.
	Aq. ad (Distilled Water to)	℥iv.

Dissolve the salt in half the water and add one ounce of mucilage of tragacanth. Into this pour the extract, previously mixed with the remainder of the water.

The following prescription well illustrates the importance of diluting incompatible ingredients before mixing:

℞	Potass. Iodid. (Potassium Iodide)	ʒiij.
	Tinct. Aurantii (Tincture of Orange)	ʒiv.
	Ext. Cinchonæ Liq. (Liquid Extract of Cinchona)	ʒiij.
	Glycerin. (Glycerin)	ʒiv.
	Aq. Dest. ad (Distilled Water to)	℥vj.

If the salt is dissolved in the water, the other ingredients added in the order named, and made up to volume, a precipitate is formed that cannot be afterwards diffused by shaking. If, on the other hand, the iodide is dissolved in half the water, the tincture mixed with the glycerin and liquid extract, and then poured into the other half of the water, on bringing the two solutions together a light bulky precipitate is formed which diffuses easily on shaking.

℞	Zinci Oxidi (Zinc Oxide)	ʒij.
	Liq. Plumbi Fort. (Strong Lead Solution)	ʒij.
	Lin. Calcis ad (Lime Liniment to)	℥viij.

Mixed in the ordinary way this produces an unsightly mess. Lin. Calcis, it will be remembered, consists of equal parts of olive oil and lime-water. If the zinc oxide is first incorporated with the olive oil, the mixed lime-water and lead solution added all at once, and well shaken, a presentable application may be turned out.

℞	Tinct. Iodi Mit. (Weak Tincture of Iodine)	♏xx.
	Menthol (Menthol)	gr. iv.
	Cocainæ (Cocaine)	gr. iij.
	Sp. Rect. (Rectified Spirit)	ʒss.
	Aq. Dest. ad (Distilled Water to)	ʒj.

If the cocaine and menthol are dissolved in the alcohol, the tincture added, and made up with water, a fairly presentable mixture results. It will not keep without separating, and, if possible, the water should be replaced by alcohol.

℞	Potass. Bromid. (Potassium Bromide) . . .	ʒiij.
	Tinct. Gelsemii (Tincture of Gelsemium) . .	ʒj.
	Aq. Camph. ad (Camphor Water to) . . .	℥vj.

The mixture is clear when first made, but becomes turbid on standing; this is due to resinous matter and camphor being salted out by the bromide. Two drachms of mucilage of acacia should be added before pouring in the tincture.

Colour Changes in Mixtures

Mixtures containing colouring principles, such as compound tincture of cardamoms and compound tincture of lavender, when combined with alkalies, especially ammonia, are always liable to change on keeping. The following, when first made, is pinkish, but after a few hours becomes nearly colourless, the colouring matter of the cochineal being precipitated :

℞	Potass. Brom. (Potassium Bromide) . . .	ʒij.
	Ammon. Carb. (Ammonium Carbonate) . .	℈ij.
	Tr. Card. Co. (Compound Tincture of Cardamoms)	ʒiij.
	Aq. Dest. ad (Distilled Water to)	℥vj.

Salicylates when combined with alkalies invariably darken, and in some cases become nearly black—

℞	Sodii Salicylat. (Sodium Salicylate) . . .	ʒij.
	Sodii Bicarb. (Sodium Bicarbonate) . . .	ʒij.
	Sp. Ammon. Arom. (Aromatic Spirit of Ammonia)	ʒij.
	Syr. Zingiberis (Syrup of Ginger) . . .	ʒiv.
	Aq. Dest. ad (Distilled Water to)	℥vj.

This turns brown in a few hours, but therapeutically is probably unchanged.

A curious mixture that may become bluish on keeping is—

℞	Tr. Nucis Vom. (Tincture of Nux Vomica)	ʒij.
	Sp. Ammon. Arom. (Aromatic Spirit of Ammonia)	ʒiv.
	Ammon. Bromid. (Ammonium Bromide)	ʒiv.
	Magnes. Sulphat. (Magnesium Sulphate)	ʒiv.
	Syr. Zingib. (Syrup of Ginger)	ʒiv.
	Aq. Menth. Pip. ad (Peppermint Water to)	℥vj.

The blue tint is ascribed to the action of the ammonia on the nux vomica. It does not always appear, and may be due to the trace of copper so often found in nux vomica preparations.

The compound syrup of glycerophosphates, which has now so great a vogue, behaves at times in a peculiar manner. If diluted, it may set to a firm jelly within twenty-four hours.

℞	Syr. Glyceroph. Co. (Compound Syrup of Glycerophosphates)	℥j.
	Aq. Dest. ad (Distilled Water to)	℥vj.

If the diluting water is first boiled, the change is retarded.

Resorcin is a common ingredient in hair-lotions; so long as no alkali is present there is no change; but if such a combination is ordered, oxygen is absorbed and the lotion darkens rapidly. Thus:

℞	Resorcin (Resorcin)	gr. xl.
	Liq. Ammoniæ (Solution of Ammonia)	ʒiv.
	β-naphthol. (Betanaphthol)	ʒss.
	Sp. Rosmar. (Spirit of Rosemary)	℥j.
	Aq. Rosæ ad (Rose-water to)	℥vj.

(*f*) *Mixtures containing incompatibles.*—Incompatible substances cannot exist together *in solution;* nevertheless mixtures containing incompatibles are frequently met with. Sometimes the combination is intentional—

℞	Zinci Sulph. (Zinc Sulphate)	gr. ij.
	Plumbi Acet. (Lead Acetate)	gr. iv.
	Ext. Opii Liq. (Liquid Extract of Opium)	♏xxx.
	Aq. Dest. ad (Distilled Water to)	℥iij.

In this injection, part of the lead is precipitated as sulphate and part as meconate, acetates remaining in solution.

The following is another example of an incompatible mixture which should always be dispensed as written:

℞	Quin. Sulph. (Quinine Sulphate)	gr. viij.
	Potass. Iodid. (Potassium Iodide)	gr. xx.
	Potass. Bicarb. (Potassium Bicarbonate)	ʒij.
	P. Tragacanth. (Powdered Tragacanth)	gr. xx.
	Aq. Dest. ad (Distilled Water to)	℥viij.

The following gargle is incompatible, and nothing can be done with it:

℞	Potass. Chlorat. (Potassium Chlorate)	ʒj.
	Acid. Sulphuros. (Sulphurous Acid)	ʒiij.
	Glycerin. (Glycerin)	℥iss.
	Aq. Dest. ad (Distilled Water to)	℥viij.

The sulphurous acid is oxidised to sulphuric, an equivalent amount of the chlorate being reduced to the chloride.

℞	Tr. Ferri Perchlor. (Tincture of Perchloride of Iron)	ʒiij.
	Acid. Hydrobrom. Dil. (Diluted Hydrobromic Acid)	ʒiij.
	Quin. Sulph. (Quinine Sulphate)	gr. xij.
	Syr. Aurant. (Syrup of Orange)	℥ij.
	Aq. Chlorof. ad (Chloroform Water to)	℥vj.

At first sight this mixture presents no abnormal features. Instead, however, of turning out a pale amber colour, it is the colour of port wine. This is due to the formation of ferric bromide.

The following mixture, although not dangerous, is often seen, and is a wonderful example of incompatibility:

℞	Potass. Iodid. (Potassium Iodide)	ʒss.
	Quin. Sulph. (Quinine Sulphate)	gr. xij.
	Acid. Sulph. Dil. (Diluted Sulphuric Acid)	♏xx.
	Aq. Dest. ad (Distilled Water to)	℥vj.

After standing for a few hours a red crystalline deposit of iodo-sulphate of quinine (herapathite) is formed. If mucilage of acacia is first added, the deposit is amorphous and easily diffused.

Another objectionable, if not dangerous, mixture that has been noticed, consists of—

℞	Phenazoni (Phenazone)	ʒj.
	Sodii Salicyl. (Sodium Salicylate)	ʒiij.
	Potass. Bromid. (Potassium Bromide)	ʒiv.
	Magnes. Sulph. (Magnesium Sulphate)	℥j.
	Glycerin. (Glycerin)	ʒiv.
	Aq. Dest. ad (Distilled Water to)	℥viij.

On standing, a copious deposit of crystals containing phenazone associated with magnesia and salicylic acid is formed.

In the next mixture there are no means of preventing the decomposition of the mercuric chloride by the bicarbonate, a precipitate of red oxide of mercury forming on standing; hence the prescriber must be acquainted with the incompatibility:

℞	Liq. Hydrarg. Perch. (Solution of Mercuric Chloride)	ʒiv.
	Sodii Bicarb. (Sodium Bicarbonate)	ʒij.
	Syr. Zingib. (Syrup of Ginger)	ʒiv.
	Inf. Quassiæ ad (Infusion of Quassia to)	℥vj.

℞ Pot. Bromid. (Potassium Bromide)	ʒiij.
Chloral Hyd. (Chloral Hydrate)	ʒiij.
Tinct. Camph. Co. (Comp. Tincture of Camphor)	℥iss.
Syrup. Zingib. ad (Syrup of Ginger to)	℥iij.

Although this mixture is clear when first made, an oily layer—of chloral alcoholate—collects at the top. If the prescriber cannot be communicated with, it may be dispensed with a 'shake the bottle' label.

It is difficult to lay down any general rule for the treatment of incompatible mixtures; but, if any of the ingredients are likely to interact and produce *dangerous* decomposition products, it becomes the duty of the pharmacist to communicate with the prescriber.

In no case should medicine be sent out which, in the judgment of the dispenser, is likely to cause unpleasant symptoms or endanger the patient's life. If, on the other hand, no harm is likely to accrue from mixing incompatible substances, the dispenser should, unless there is reason to believe it to be due to an oversight, compound the medicine as elegantly as possible.

Combinations such as the following are **Dangerous**:

Poisonous Alkaloidal Salts with alkalies, alkaline or earthy carbonates, soluble arsenates, tannic acid, astringent tinctures (such as Tr. Catechu, Tr. Gallæ), borax, iodides, and bromides.

Thus:

℞ Strych. Sulph. (Strychnine Sulphate)	gr. j.
Potass. Bromid. (Potassium Bromide)	ʒvj.
Aq. Dest. ad. (Distilled Water to)	℥vj.

This mixture remains clear for some time after mixing, but ultimately deposits crystals of strychnine bromide, and the patient may be poisoned.

Although alkalies are incompatible with solutions of alkaloidal salts, it does not follow that the alkaloid will *always* be precipitated. The following mixture remains clear:

℞ Liq. Strych. Hyd. (Solution of Strychnine Hydrochloride)	♏xl.
Sodii Bicarb. (Sodium Bicarbonate)	ʒij.
Aq. Dest. ad (Distilled Water to)	℥viij.

Strychnine is soluble 1 in 5700, and as the mixture in question is more dilute (1 in 9600) no deposition of crystals takes place.

The following is also a dangerous type of mixture:

℞ Hyd. Perchlor. (Mercuric Chloride)	gr. ij.
Potass. Iodid. (Potassium Iodide)	ʒiv.
Liq. Strych. Hyd. (Solution of Strychnine Hydrochloride)	ʒij.
Inf. Aurant. ad (Infusion of Orange to)	℥viij.

Here a double iodide of mercury and potassium is formed, which precipitates the strychnine.

A mixture that at first sight appears to be safe is—

℞ Liq. Strych. Hyd. (Solution of Strychnine Hydrochloride)	ʒiv.
Elixir Glusidi ad (Elixir of Saccharin to)	℥iv.

Here the alkaloid is thrown out by the soda of the soluble saccharin.

Antipyrine with nitrites, persalts of iron, sodium salicylate, chloral hydrate, tannic acid, mercuric chloride, phenol, and β-naphthol.

Thus:

℞ Sodii Bromid. (Sodium Bromide)	ʒiv.
Phenazoni (Antipyrine)	ʒij.
Chloral. Hyd. (Chloral Hydrate)	ʒij.
Syr. Limonis (Syrup of Lemon)	℥j.
Aq. Dest. ad (Distilled Water to)	℥iv.

On mixing, an insoluble oily compound (which may afterwards crystallise) of phenazone and chloral is formed.

If it is specially desired to combine spirit of nitrous ether with phenazone, sodium bicarbonate should be added to prevent the formation of iso-nitroso-phenazone, which otherwise imparts a green colour to the mixture.

Arsenic Salts with salts of magnesia, persalts of iron, mercuric chloride, or astringents. Arsenates must not be dispensed with solutions of alkaloids. Thus: Solution of arsenic is incompatible with Epsom salt, or with tincture of hamamelis.

Bromides with poisonous alkaloids or mercurous salts (see also Iodides). It may not be generally known that bromides are incompatible with paraldehyde—bromates being formed.

Chloral Hydrate with antipyrine: in this case mono-chloral phenazone is formed. Alkalies and alkaline carbonates liberate chloroform.

Iodides with poisonous alkaloids, chlorates, or spirit of nitrous ether (unless containing free alkali).

The following *apparently* harmless mixture, containing ferrous iodide and potassium chlorate, caused death:

℞ Potass. Chlorat. (Potassium Chlorate)	ʒij.
Syr. Ferri Iodid. (Syrup of Ferrous Iodide)	ʒvj.
Vin. Antim. (Antimonial Wine)	♏xxx.
Sp. Chlorof. (Spirit of Chloroform)	ʒij.
Aq. Dest. ad (Distilled Water to)	℥viij.

This mixture is almost colourless when first prepared, but rapidly turns brown, and after a few days deposits crystals of iodine.

Another mixture of the same class is—

℞ Pot. Tart. Acid. (Acid Tartrate of Potassium)	ʒiv.
Potass. Iodid. (Potassium Iodide)	ʒj.
Sp. Æther. Nit. (Spirit of Nitrous Ether)	ʒiv.
Aq. Dest. ad (Distilled Water to)	ʒviij.

In this case the sweet nitre is decomposed and iodine liberated.

Soluble iodides or bromides must not be dispensed with mercurous salts—

℞ Potass. Brom. (Potassium Bromide)	gr. x.
Hyd. Subchlor. (Calomel)	gr. iij.

On rubbing together, some metallic mercury separates, and a poisonous double salt, mercuric-potassium bromide, is formed.

Nitroglycerin Solution in an aqueous mixture, unless the mixture contains sufficient alcohol to keep the nitroglycerin in solution.

Spirit of Nitrous Ether forms dangerous mixtures with iodides and bromides, unless free alkali is present. It is incompatible with phenazone and salicylates.

Salicylates, although not forming dangerous compounds, give brownish mixtures with alkalies, alkaline carbonates, and ammonia.

Strychnine. See Poisonous Alkaloids.

(*g*) EXPLOSIVE COMBINATIONS

It occasionally happens that substances are ordered in prescriptions which, if brought together in the ordinary manner, may combine with explosive violence.

Chlorates should not be rubbed in a mortar or heated with—antimony sulphide, carbolic acid, catechu, creosote, gallic acid, glycerin, hypophosphites, iodine, iodol, lycopodium, oxalic acid, salicylic acid, shellac, sugar, sulphur, or tannic acid.

Erythrol Tetranitrate must not be powdered with any readily oxidisable substance. When required in powder it may be safely triturated in a perfectly clean mortar with a *wooden* pestle.

Hypophosphites may decompose violently when heated or when rubbed with chlorates. They should not be dissolved in boiling water.

Iodine ignites oil of turpentine. A flare-up nearly always results if the following pigment is attempted:

Oil of Turpentine	℥ij.
Stockholm Tar	ʒiv.
Iodine	ʒss.

Iodine should never be mixed with strong solution of ammonia on account of the formation of nitrogen iodide—one of the most dangerous explosive compounds.

Iodol decomposes with violence when mixed with chlorates or with mercuric oxide.

Phosphorus inflames spontaneously in air, and should always be kept under water. When required for dispensing, it should be lifted out on the point of a knife or sharp wire, quickly dried with clean blotting-paper, and weighed as rapidly as possible—on a counterpoised watch-glass, and *not* on a metal scale-pan.

Picric Acid and **Picrates** should not be triturated. When heated in the dry, especially with calcium oxide, they may explode.

Potassium Dichromate or **Chromic Anhydride** must not be mixed with glycerin or alcohol.

Potassium Permanganate or other permanganates may give rise to an explosion when mixed with glycerin, alcohol, sulphides, fats, oils, or sugar.

Potassium and **Sodium** should be preserved under benzene or other suitable hydrocarbon. Especial care should be taken when handling not to bring any piece into contact with water.

Silver Oxide explodes when rubbed with creosote, phenol, or potassium permanganate. If, however, it is diluted with kaolin and then massed with paraffin ointment, it may be made into pills without much risk. Pills containing silver oxide, if massed with syrup, glucose, or other reducing agent, swell up and crumble, but rarely explode.

Explosions sometimes occur in mixtures containing bismuth oxynitrate or other acid compounds and alkaline carbonates or bicarbonates. This is due to liberation of carbon dioxide, and has already been discussed.

POWDERS AND CACHETS

The division of all powders for internal administration should be performed with the utmost exactitude, and in no case should the lazy and inaccurate method of subdivision by means of measures be resorted to. Flattening out a powder and dividing it into apparently equal proportions by means of a spatula is an even worse offence.

For rapid weighing hand-balances (fig. 5) are generally preferred to the pillar pattern. In some balances one scale-pan is made of glass, but, unless great care is exercised, the edges chip, which, if not observed and corrected, impairs the accuracy of the weighing.

Paper for wrapping powders should be plain white with a glazed surface. When one or two dozen powders have to be wrapped, it is convenient to lay all the papers on the bench in rows and weigh out the whole number before commencing to fold. Wrapping is accomplished by folding the paper away from the operator to within half an inch of the margin; the further edge is then folded inwards and again on itself, making a double pleat, when the ends are finally doubled over equally on one of the devices shown in figs. 47 and 48, and flattened with a bone or vulcanite knife.

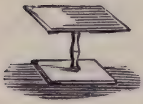

FIG. 47.—POWDER-FOLDER.

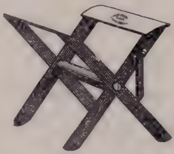

FIG. 48.—POWDER-FOLDER.

Powders are generally sent out in card boxes, and the appearance is greatly enhanced if the height of the packets corresponds exactly with the depth of the box.

Hygroscopic powders, such as lithium citrate, should be wrapped in *paraffined* paper.

The ingredients may sometimes be prescribed in proportions which are inconvenient to dispense. The following is an example:

℞ Morph. Hyd. (Morphine Hydrochloride)	gr. $\frac{1}{12}$.
Bism. Subnit. (Bismuth Oxynitrate)	gr. v.
Pepsin	gr. ij.

Ft. pulv. j. Mitte xij.

If sufficient of each ingredient to produce twelve powders is taken, each powder would weigh $7\frac{1}{12}$ grains, and it would not be easy to divide such a mixture into twelve equal parts.

The correct method is to weigh 1 grain of morphine hydrochloride, and to mix it intimately with 5 grains of an inert powder such as milk sugar; 60 grains of bismuth oxynitrate, and 24 grains of pepsin are next incorporated and the whole thoroughly mixed. The mixture is then divided into twelve powders of $7\frac{1}{2}$ grains each.

No powder should ever be sent out weighing *less* than 1 grain, but should be made up to this weight by the addition of sugar of milk or other suitable diluent.

The following prescription illustrates the method of procedure when the quantities required are practically unweighable:

℞ Ac. Arsen. (Arsenious Oxide)	gr. $\frac{1}{60}$.
Strych. Hyd. (Strychnine Hydrochloride)	gr. $\frac{1}{100}$.
Quinin. Sulph. (Quinine Sulphate)	gr. ij.

M. ft. pulv. j. Mitte xij.

It is necessary in this case to prepare *triturates* of the first two ingredients of such strength that the requisite amounts can be weighed from them. The amount of arsenious oxide required is $12 \times \frac{1}{60} = \frac{1}{5}$ grain, so that if 1 grain of arsenious oxide is carefully mixed with 4 grains of sugar of milk each grain of the mixture will contain $\frac{1}{5}$ grain of arsenious oxide. Similarly, the amount of strychnine hydrochloride required is $12 \times \frac{1}{100} = \frac{3}{25}$ grain, so that if 1 grain of strychnine hydrochloride is mixed with 24 grains of sugar of milk each grain of the mixture will contain $\frac{1}{25}$ grain strychnine hydrochloride.

Having made these triturates, the powders are prepared as follows :

Arsenious Oxide triturate	1 grain
Strychnine Hydrochloride triturate	3 grains
Quinine Sulphate	24 ,,
Sugar of Milk	2 ,,

the sugar of milk being necessary to adjust the weight as $\frac{28}{12} = 2\frac{1}{3}$ grains, and this fraction of a grain cannot be weighed.

Cachets.—The essential qualities of a perfect cachet are convenience and ready solubility. The basis from which cachets are made is perhaps of the least harmful nature possible, consisting merely of flour and water. This material after it has been dipped in cold water becomes quite soft and limp, and powders enveloped in it are swallowed without difficulty.

Directions for filling and closing.—In the apparatus shown in figs. 50–53, the cachets are pressed with the fingers into the spaces in the middle plate, B. The plate C is then folded over on its hinge, thus protecting the rim of the cachet from contact with the powder. The powder is next introduced by means of the small funnel, as shown in fig. 51, and pressed down with the thimble provided.

When all the cachets have been filled, the plate C is lifted up, and the damping-roller, which must not be too wet, passed over the edges of the cachets in the plate A (fig. 52). A is then folded over B, when a slight pressure closes all the cachets at once. The cachets are pressed out on to a sheet of paper to allow the edges to dry and harden before being handled.

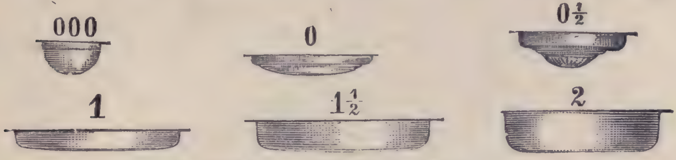

FIG. 49.—EMPTY CACHETS.

No. 000	will hold	1½	grains of	quinine sulphate.
,, 0	,,	3 to 4½	,,	,,
,, 0½	,,	6 to 7½	,,	,,
,, 1	,,	9 to 10½	,,	,,
,, 1½	,,	10½ to 15	,,	,,
,, 2	,,	15 to 18	,,	,,

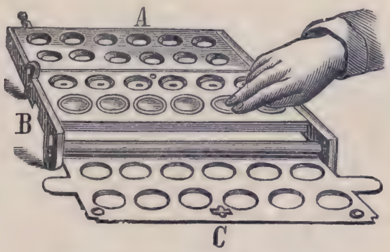

FIG. 50.—CACHET-APPARATUS.

Smaller forms of apparatus are worked on the same principle, the difference being that only three cachets of one size are closed at a time instead of twelve (fig. 54).

An improved form of cachet is in use under the name of *Koseal*. In this, the shape of the rim has been altered on the inside by raising a portion, as will be seen in fig. 55. The object of this is to simplify the process of moistening, as some difficulty is occasionally experienced in obtaining just the right degree of dampness when closing the cachets. If made too wet, ordinary cachets are liable to crinkle and look

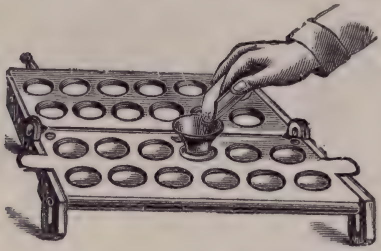

FIG. 51.—CACHET-APPARATUS.

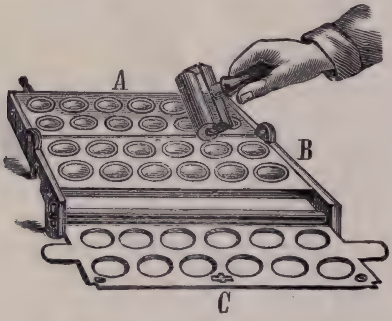

FIG. 52.—CACHET-APPARATUS.

unsightly at the edge, and if insufficiently moistened the two halves do not cohere. Figs. 56 and 57 show the finished 'Koseal.' If considerable pressure is used in closing them, their appearance differs in no way from that of ordinary cachets, but if slight pressure is employed the two halevs only cohere around the raised rim, the finished cachet appearing as in fig. 57.

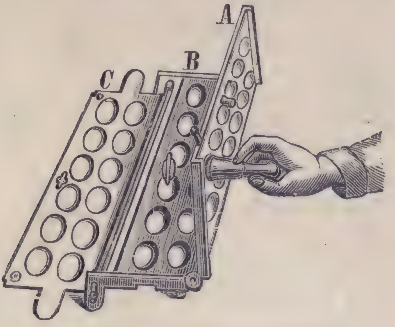

FIG. 53.—CACHET-APPARATUS.

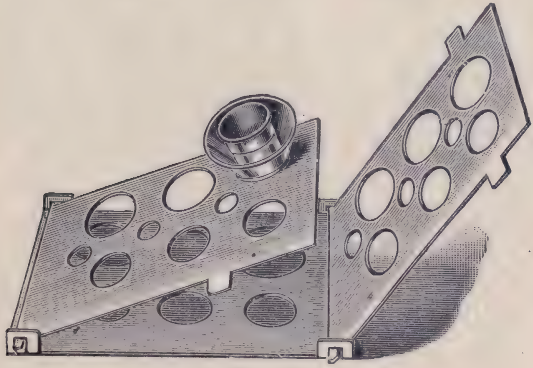

FIG. 54.

℞ Pulv. Rhei (Powdered Rhubarb) . . .	gr. v.
Sodii Bicarb. (Sodium Bicarbonate) . . .	gr. x.
Strychninæ (Strychnine)	gr. $\frac{1}{50}$

For one cachet. The strychnine must be thoroughly triturated with a little of the bicarbonate before mixing with the rest of the ingredients.

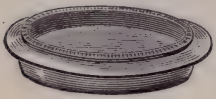
FIG. 55.

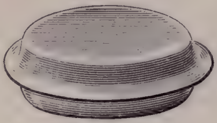
FIG. 56.

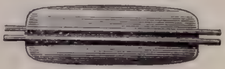
FIG 57.

℞ Phenacetin (Phenacetin)	gr. x.
Caffeinæ (Caffeine)	gr. j.

For one cachet.

℞ P. Carbo. Lig. (Powdered Charcoal) . . .	gr. x.
Potass. Bicarb. (Potassium Bicarbonate) . .	gr. viij.

For one cachet.

PILLS

Pills are small ovoid or spherical masses of medicament, intended to be swallowed whole, without previous mastication. Their weight may vary from 1 to 5 grains, but occasionally, when the medicament is very dense, they may weigh considerably more without being abnormally large. Very small pills are sometimes erroneously called *granules*.

A practical acquaintance with the art of pill-making, both extemporaneously and in bulk, is of the first importance to the dispenser, as the preparation of a good pill-mass requires judgment as well as manipulative dexterity.

Pill-apparatus.—For the preparation of small quantities of pills at the dispensing counter, the mortar used for massing the ingredients should be made of Wedgwood ware, somewhat shallow, with well-rounded edges. Many pill-mortars are provided with a spout—a useless and inconvenient addition. The pestles supplied with the mortars are, as a rule, much too short: it is found by experience that the handle should not be less than eight inches in length, almost cylindrical, with a well-rounded end that will fit comfortably into the palm of the hand when kneading, as fig. 58. Mortars for larger quantities are frequently made of bell-metal or iron, as fig. 59, some of the older patterns being often beautifully

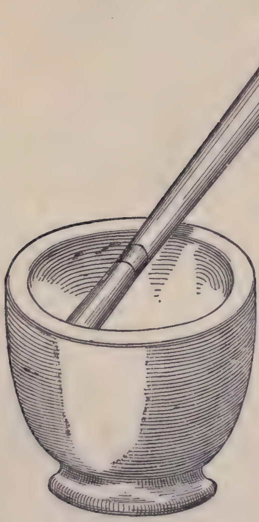

FIG. 58.—PILL-MORTAR.

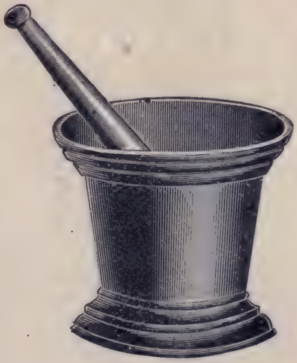

FIG. 59.—METAL MORTAR.

moulded. To assist in kneading the mass, as well as to prevent loss of material when pounding a dry substance, these metal mortars are provided with stout wooden covers, as fig. 60.

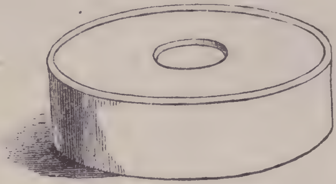

FIG. 60.—MORTAR-COVER.

A good operator can frequently manipulate a pill-mass so deftly that scarcely any of the material will finally adhere to the bottom of the mortar; but as *during* the operation the mass generally requires loosening, special knives are employed, having short stiff blades. These should have well-rounded handles, enabling them to be used with comfort. The machine for piping and dividing the mass into pills is usually made of mahogany, with brass runners and cutting surfaces, as fig. 61. In cutting pills by hand, it is necessary that the machine

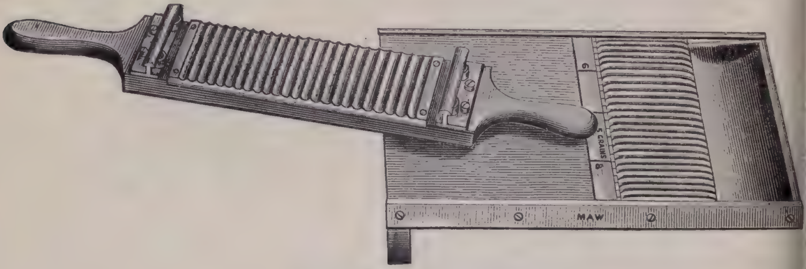

FIG. 61.—PILL-MACHINE.

should rest on a firm bench, as considerable force is exerted in rolling hard masses.

The pills as a rule are not perfectly round when they leave the grooves, and to finish them off they are rolled in an eccentric manner beneath a rounder (fig. 62), made of either boxwood or metal, a little starch being used to prevent the pills sticking together.

The advantage of using a metal pill-finisher is that it can be warmed over a Bunsen burner for very hard pills. Many pharmacists make use of a thick slab of iron, heated over a gas flame, for softening very hard pill-masses. It should not be resorted to where heat is likely to injure the ingredients.

Preparation of the mass.—The pill-mass may be divided into two parts—the active ingredients, and the *excipient* or material used to bind the mass and give it proper consistence. In the first place, all the dry ingredients must be in very fine powder; in fact, other things being equal, the finer the powder, the more plastic the mass.

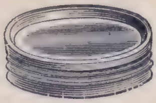

Fig. 62.
Pill-rounder.

The chief characteristics of well-made pills should be uniformity of dose and size, as well as ready solubility when introduced into the system. For the production of pills complying with the above conditions the ingredients must be thoroughly mixed before the addition of any excipient. Potent remedies, such as the toxic alkaloids, should be carefully diluted with a little milk-sugar before mixing with the bulk of the material.

It occasionally happens that a fraction of a grain of some very active ingredient is ordered in a pill, which it is impossible to weigh directly. In such a case, the substance may be mixed with milk-sugar in such proportions that an aliquot part can be weighed off. Thus, if twenty-four pills are required, each containing $\frac{1}{30}$ of a grain of strychnine, one grain of the alkaloid should be intimately mixed with nine grains of diluent, and eight grains of the mixture taken, representing $\frac{8}{10}$ or $\frac{24}{30}$ of a grain. Or it may happen that twenty-four pills are ordered, each containing $\frac{1}{25}$ of a grain of the active ingredient. In this case it is more convenient to calculate for twenty-five pills taking one grain of strychnine for the purpose. One pill may be thrown away. One of the objects in pill-making should be to keep the pill as small as possible, but no pills ought to be sent out weighing *less* than one grain.

After each addition of excipient the mixture is detached from the side of the mortar, and well kneaded until a uniform plastic mass results. Before rolling, the gross weight of the mass should be entered in the prescription-book. This practice should never be omitted, as errors in weighing the ingredients may sometimes thus be detected, while it ensures that the pills are always sent out of the same size and weight.

Pill-excipients.—Under this name are comprised all the materials used to bind the ingredients into a mass. In selecting liquid excipients, care must be exercised not to use any that act as complete solvents, nor any powders likely to form insoluble compounds with the ingredients. While not *entirely* dissolving the materials, a liquid excipient should possess a modified solvent action, as proof spirit for resinous powders, or else be sufficiently sticky, as glucose, to bind them into a plastic mass. Such excipients require to be added very cautiously, with constant kneading, or the mass will become too soft for rolling. When the first additions of excipient are made the mass may at first appear rather dry and crumbly, but after a few minutes' brisk kneading, owing to the heat generated, it should begin to bind.

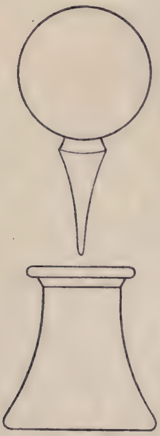

FIG. 63.—EXCIPIENT-BOTTLE.

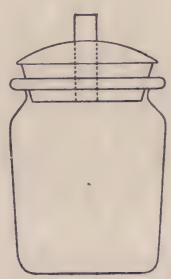

FIG. 64.—EXCIPIENT-BOTTLE.

To avoid the danger of adding too much excipient at one time, and so making the pills too large or too soft, liquid excipients should be kept in 1 oz. bottles into which a small pipette attached to a rubber ball just dips (fig. 63). By lightly squeezing the ball, as small a quantity as desired may then be dropped upon the ingredients. Dry excipients may be kept in wide-mouthed bottles provided with a perforated cork in which a short piece of quill is inserted (fig. 64).

Although special excipients have been recommended from time to time, it is generally found that good dispensers rely on two or three only, with the behaviour of which they are well acquainted.

White powders generally may be made into a mass with compound powder of tragacanth and a little syrup, with glucose, or with glucanth. Glycerin should be avoided, as pills containing much of it are liable to lose their shape and become sticky through absorption of moisture.

Coloured powders may be massed with any appropriate, physiologically inert excipient. The most useful are glucose, extract of gentian, syrup, &c.

Methods of Treatment

Acid, benzoic.—Mass with glucanth or a little tragacanth and simple syrup.

Acid, carbolic.—Carbolic acid in pills may be treated in several ways, one of which is to add one-twentieth the weight of glycerin, afterwards massing with a mixture of wheaten flour eight parts and tragacanth two parts. Another and better method is to mass with wheaten flour and hard paraffin. If desired, the following mass, containing 50 per cent. of phenol, may be kept ready made:

Absolute Phenol	60 parts
Hard Paraffin	12 ,,
Wheaten Flour	45 ,,
Glucanth	3 ,,

Pills made from this formula readily disintegrate in lukewarm water, and no objection is likely to be raised to the presence of paraffin.

Aloes, Asafetida, and other resinous powders.—The best excipient for pills containing these, especially when in combination with extract of colocynth and similar drugs, is 45-per-cent. alcohol. Pills composed of extract of aloes alone should be mixed with one-tenth their weight of powdered liquorice and massed with rectified spirit.

Antipyrine, Phenacetin, and other white powders.—With glucanth, or tragacanth and syrup.

Bismuth carbonate and oxynitrate.—With glucanth, or compound tragacanth powder and syrup.

Calcium sulphide.—Usually ordered in small quantities; should be first mixed with milk-sugar, and then massed with tragacanth and syrup or with glucanth.

Calomel.—Confection of roses has been recommended for massing calomel, but it is better to follow the rule of only using white excipients for white pills. Strained manna, glucanth, or tragacanth and syrup answers every purpose.

Camphor is often stated to give trouble. This may be true if combined with substances which liquefy when rubbed with camphor, as chloral, phenol, &c., but camphor *per se* is not really difficult to manipulate. The secret is to powder the camphor finely; if then it is mixed with a little starch or wheaten flour, it may be massed with glucanth without trouble. When ordered with extract of henbane or other 'green' extract, the camphor, if powdered finely, frequently forms a very good pill without further addition; but with equal parts of camphor and extract of henbane, the mass is too soft, and should be stiffened with equal parts of tragacanth and wheaten flour.

Creosote is usually more troublesome than camphor. The best plan is to keep a 50-per-cent. creosote mass ready made, which may be dispensed from as required. The following modification of Martindale's formula gives very good results. To fifty parts of creosote in a wide-mouthed bottle add fifteen parts of melted yellow wax and thirty-five parts of powdered *curd* soap. Cork, and heat on a water-bath, shaking occasionally, until combination takes place. This, when cold, gives a plastic and fairly stiff mass, which only requires the addition of a little powder when dispensing. The use of magnesia for massing is not to be recommended, the pills becoming as hard as marbles and almost as insoluble.

Crystalline salts, such as potassium and ammonium bromide, potassium iodide, &c., should, after powdering very finely, be mixed with one-tenth their weight of tragacanth, and massed with syrup. Glycerin in any form should never be used.

Extracts, such as 'ergotin' and the 'green' extracts generally, are not sufficiently firm for making into pills. It is customary, therefore, to evaporate them over a water-bath until sufficiently hardened, making a note on the label that six parts represent eight parts of the soft extract, or whatever the case may be. In addition, most dispensers use *powdered* extracts, and, provided these have been prepared by evaporation *in vacuo*, there can be no objection to their use. Those most frequently required are the powdered extracts of belladonna, nux vomica, henbane, gentian, taraxacum, compound extract of colocynth, &c. If properly prepared these should not have lost any of the characteristic odour during drying, and particularly they should not be hygroscopic.

Iron phosphate.—This is frequently ordered in combination with quinine and strychnine. It is customary to mass with syrupy phosphoric acid (sp. gr. 1·5). The mass should be worked and rolled rapidly, as it sets almost at once.

Iron, reduced.—Powder *very finely*, mix with one-tenth its weight of tragacanth, and mass with glucanth.

Iron sulphate, dried.—This is best massed with syrup or glucose, taking care to add enough at once, or a crumbly mass results.

Lithium guaiacate.—Powder finely and make into a rather soft mass with rectified spirit. Work up and roll without delay, as the mass hardens very rapidly.

Mercury with chalk.—Hydrarg. c̄. Cretâ requires very careful manipulation in kneading. If the mass is made too hard, the mercury separates. Extract of gentian is an excellent excipient. Wheaten flour and glucanth also make a good pill.

Oils, essential.—When considerable quantities of essential oils are ordered in pills, the best results are obtained by massing with a mixture of equal parts of powdered curd soap, calcium phosphate, and wheaten flour. If absolutely necessary, a small proportion of yellow wax may be melted with the oil, but the quantity must not exceed one-tenth the weight, or the pills will probably not disintegrate.

Pepsin.—The so-called *insoluble* pepsin does not make good pills, but if a mixture of two parts of insoluble and one part of powdered *soluble* scales is employed, an excellent pill may be made with the help of syrup.

Phosphorus.—When small doses of phosphorus are ordered, it may be possible to use an equivalent quantity of Pil. Phosphori B.P., but if this would unduly increase the bulk, 10 per cent. phosphorated suet must be used. Take of—

Phosphorus	10 grains
Carbon Disulphide	1 fl. drachm
Suet	90 grains

Dissolve the phosphorus in the carbon disulphide in a bottle, add a little of the suet, and shake well; then add the remainder, mix thoroughly, allow the disulphide to evaporate, and preserve the mass under water.

This basis contains 10 per cent. of phosphorus.

Potassium permanganate for obvious reasons must not be massed with any readily oxidisable excipient. Very good pills may be made with kaolin ointment, or, if not at hand, with what amounts to the same thing, Unguentum Paraffini B.P. and fullers' earth. Lanolin has also been recommended, as well as resin ointment, but pills massed with these excipients decompose after a time.

Quinine and iron citrate, Iron and ammonium citrate. —Powder finely, add one-twentieth of powdered tragacanth, and mass with syrup; or use the official Unguentum Paraffini. Many dispensers prefer to moisten the powdered scales with proof spirit, in which case the mass must be kneaded and rolled out as quickly as possible. Under no circumstances must any preparation of glycerin be used. The pills should be varnished to protect them from the air.

Quinine sulphate may be massed with glucanth or tragacanth and syrup.

Rhubarb and other vegetable powders mass readily with syrup and a trace of tragacanth.

Salol is more frequently prescribed in tablets or cachets than in pilular form. It may, however, be made into pills with glucanth. The mass should not be worked too vigorously, as salol melts at about 42° C., and is then intractable.

Silver nitrate, Silver oxide, should be finely powdered with white fullers' earth and massed with Unguentum Paraffini B.P. Breadcrumb should never be used, as it not only yields unsatisfactory pills, but contains sodium chloride, with which silver nitrate is incompatible.

Sulphur.—When sulphur is ordered in pills, either alone or with other ingredients, only the 'washed' variety should be used. This, if finely powdered, gives no trouble with the ordinary excipients.

Tar pills are now seldom prescribed, but may be prepared by adding one-fifth the weight of melted yellow wax to the tar in a warm mortar; a mixture of equal parts of lycopodium and wheaten flour should be then incorporated until the mass is sufficiently firm for rolling into pills.

Zinc valerianate, if ordered alone in pills, should be reduced to fine powder, one-twentieth of powdered acacia added, and massed with glucanth. It is, however, frequently prescribed with asafetida and other resins, when the mixed powders only need slightly moistening with rectified spirit to produce an excellent mass.

CLASSIFIED LIST OF EXCIPIENTS

Acacia powder and mucilage. Avoid as much as possible, as pills containing this gum become exceedingly hard.

Alcohol for resinous pills.

Althæa in fine powder. Useful as an absorbent; has tendency to make pills somewhat spongy.

Breadcrumb.—Useless.

Calcium phosphate.—Either alone, or mixed with wheaten flour, for essential oils.

Confection of roses has nothing to recommend its use over many other more reliable excipients.

Decoction of aloes, compound.—Useful on account of the carbonate of potassium it contains. May be used for most pills containing aloes. Incompatible with iron salts.

Elm bark in fine powder is used for the same purposes as powdered althæa.

Fullers' earth, Kaolin.—Useful for such pills as potassium permanganate, silver nitrate, &c.

Glucanth.—A mixture of—

Tragacanth	½ ounce
Water	½ ,,
Syrupy Glucose	5 ounces

Mix the glucose and water and then stir in the tragacanth very rapidly and allow to swell.

This excipient is useful in many instances where glycerin of tragacanth is unsuitable.

Glycerin, owing to its hygroscopic action, should be avoided as far as possible, especially for pills intended to be silvered or coated with either gelatin or French chalk.

Liquorice powder is a useful general absorbent.

Soap, curd.—Useful in massing oils, creosote, &c.

Tragacanth.—Both the simple and compound powders are valuable for binding friable, and giving firmness to soft, masses.

Tragacanth, glycerin of.—A generally useful excipient, but not suitable for pills containing salts, scale preparations, or powerful oxidising agents as permanganates, silver nitrate, &c.

Water.—Use sparingly.

Wax.—Use sparingly. See Creosote and Tar Pills.

Compound dextrin powder.

Powdered Tragacanth	1
Powdered Acacia	1
Powdered Dextrin	1
Starch	2

Useful absorbent powder, especially when the mass is disinclined to bind.

PILL-COATING

Before sending out pills it is customary either to coat them or to add a little dry powder, such as liquorice, lycopodium, starch, or French chalk. A more elegant method is to varnish or 'silver' them; or they may be coated with sugar or gelatin.

Sugar coating.—For extemporaneously coating small quantities of pills with sugar, the following process may be adopted. Moisten the pills slightly but evenly with

Sandarach Pill-varnish	1 part
Mucilage of Acacia	2 parts
Simple Syrup	4 „

and throw into a covered pot containing a mixture of

Finely Powdered Sugar	7 parts
Starch	1 part

Rotate rapidly for a few seconds, and turn out on to a hair sieve; separate the powder and rotate gently on the sieve until excess of powder has been rubbed off. Now place in another clean warm pot and rotate until perfectly dry. Repeat the operations until the pills have acquired three or four coatings, when they may be left on the sieve to dry.

Gelatin coating is perhaps one of the best methods yet devised for masking the taste and odour of nauseous pills. No expensive apparatus is necessary for its application, while the pills are exposed to undesirable conditions of temperature and moisture for the minimum of time. The coating is, moreover, both soluble and transparent.

The selection of the excipients for massing pills intended to be gelatin-coated requires considerable experience, as it is important that no hygroscopic substance, such as glycerin, be used. The pills should be fairly dry before coating, or they will be found to 'bud.' This is caused by coating damp or soft pills. The gelatin, when it dries, shrinks very considerably and forces some of the mass through the weakest part of the coating.

The pills are first shaken in a bag of soft material to free them from adhering powder; they are then impaled on long slender needles, which may be fixed in corks, and dipped in a solution of gelatin kept at a temperature of about 30° C. After withdrawal they are rotated gently while the gelatin sets, and then left to dry. The gelatin solution may be prepared as follows:

Gelatin	2 parts
Water	15 ,,
Mucilage of Acacia	1 part

Allow the gelatin to soak in the water until softened; dissolve by the heat of a water-bath; add the mucilage, strain, and make up the weight to eighteen parts. A little chloroform may be added as a preservative.

For white pills the solution must be as nearly colourless as possible, but for dark pills a little caramel may be added with advantage.

Figs. 65, 66 and 67 illustrate Niblett's pill-coating apparatus. The first figure shows the pills ready for dipping. The pills are placed in the base or pill-receiver. Each recess accommodates a pill, and as the needles on the dipper correspond in position with these recesses, the pills are taken up simultaneously. Fig. 66 shows the process of dipping. The superfluous gelatin is got rid of after withdrawing the dipper, by lowering it again until the pills just touch the surface of the liquid, after which the dipper is lifted out and rotated gently for a few seconds, when it is placed on its side until the pills are dry. Fig. 67 represents the action of expelling the pills from the needles. This is

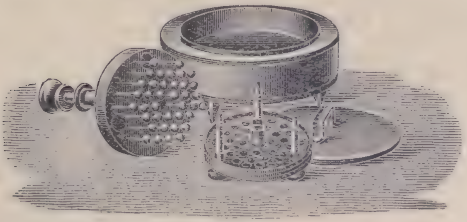
FIG. 65.

done with a sliding plate actuated by a spring, the whole of the pills being detached at once. After removal from the needles, it is sometimes found, when the pills have been dipped too deeply, that a little gelatin tube projects from each. This should be cut off with a pair of sharp scissors before sending out.

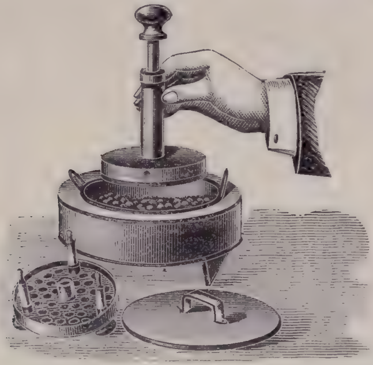

Fig. 66.

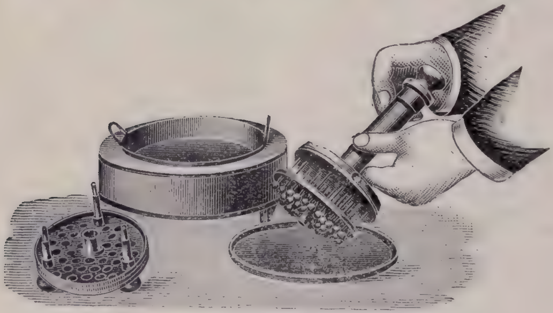

Fig. 67.

Gelatin Pill-coating.

Pearl coating is largely made use of in this country, and if properly done imparts a very pleasing appearance to the pills. The disadvantage is that the coating is insoluble, and cases are not rare where pills so coated have passed unchanged through the system. For coating small quantities extemporaneously at the dispensing counter, the perfectly round and hard pills are varnished with a very thin covering of sandarach or tolú. They are then damped evenly with a mixture of—

Mucilage of Acacia	**2 parts**
Syrup	**2 parts**

thrown into finely powdered talc, and shaken vigorously for a few moments. After sifting out the excess of powder, the pills are transferred to a perfectly smooth and clean covered pot, or a metal coater similar to fig. 68, and rotated until smooth and dry. After exposure to the air for a short time a second coat is applied in a manner similar to the first, and if necessary a third. The pills should then be allowed to dry perfectly, when they may be polished by rotating in a clean pot with a little ball of hard paraffin.

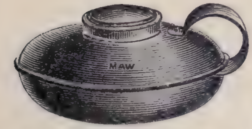

FIG. 68.—HAND COATER.

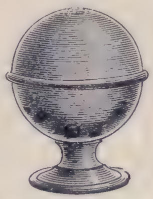

FIG. 69.—BOXWOOD PILL-SILVERER.

Keratin coating is made use of, not so much to give the pills a finished appearance as to protect them during their passage through the stomach—keratin being insoluble in the gastric juice—so that solution of the pill will not take place until the intestine is reached. The process for keratin coating is very tedious, but presents no special difficulty. The pills, which should be massed with Ung. Paraffini or Ung. Resinæ, are placed in a dish with a little of the keratin solution, and rolled about until evenly coated, when they are turned on to a porcelain tray and allowed to dry. At least three coatings are required to be of any service. To prevent the pills sticking together they may be shaken with a trace of finely powdered graphite.

Keratin Pill-coating Solution

Keratin *prepared with pepsin*	1 ounce
Solution of Ammonia 0·880	5 fl. ounces
Absolute Alcohol	5 ,,

Dissolve.

Salol has been proposed as a substitute for keratin coating when the pills are not intended for solution in the stomach, but its utility has been questioned. It may be applied by dipping the pills, fixed on needles, into melted salol, allowing to cool, detaching, and closing the needle-holes with a camel-hair pencil dipped in the melted substance.

Varnishing.—For the extemporaneous coating of pills no method has yet been introduced to supersede varnishing, and, with a little care, excellent results are attained with the least expenditure of time. The pills, as for all coating operations, should be round and firm, and free from any adhering powder; they are placed in a covered pot with a few drops of the varnish, well shaken for a few moments, and rapidly turned out into a porcelain tray to dry. The most convenient trays for the purpose are the developing-dishes used by photographers.

Pill-varnish

Sandarach	4½ ounces
Chloroform	4 fl. ounces
Ether, sp. gr. 0·717	10 ,,

Dissolve.

For dark-coloured pills a varnish made by dissolving the residue left in the manufacture of syrup of tolu may be used. The proportions are—

Tolu residue	6 ounces
Ether, sp. gr. 0·717	8 fl. ounces
Chloroform	4 fl. ounces

Silvering.—Covering pills with silver or gold leaf was one of the earliest methods of coating, and silver leaf is still employed for the same purpose. The pills are slightly moistened with very thin acacia mucilage, thrown into a covered pot or wooden coater (fig. 69) containing silver leaf, and rotated vigorously for a minute or so. They are then exposed to the air for a little time to dry, and afterwards burnished by rotating in a second clean pot. As a rule, one leaf of silver suffices for covering one dozen five-grain pills. Pills containing sulphur or sulphides should not be silvered.

The following prescriptions indicate the treatment usually adopted for certain classes of pills :

℞ Ferri Carb. Sacch. (Saccharated Carbonate of Iron)	gr. ij.
Ferri Arsen. (Iron Arsenate)	gr. $\frac{1}{12}$
Ext. Gentian (Extract of Gentian)	gr. ij.

This pill cracks after being made a little time. This is caused by liberation of carbonic acid gas, due to the action of the extract (which is generally acid) on the carbonate. It may be prevented by gently warming on a slab to promote decomposition and facilitate the escape of the gas.

℞ Bismuth. Subnit. (Bismuth Subnitrate)	gr. v.
Potass. Bichrom. (Potassium Bichromate)	gr. $\frac{1}{8}$

These pills must be massed with paraffin ointment and a little kaolin powder. No syrup, glycerin, or other reducing agent may be used.

℞ Argenti Nitratis (Silver Nitrate)	gr. $\frac{1}{2}$
Ext. Nucis Vom. (Extract of Nux Vomica)	gr. $\frac{1}{8}$

If the silver nitrate is mixed with two grains of kaolin, and massed with paraffin ointment, the extract may be incorporated with safety. The pills, however, usually crumble on keeping, owing to the reduction of some of the nitrate.

℞ Calcii Sulphid. (Calcium Sulphide)	gr. j.
Acid. Salicylic. (Salicylic Acid)	gr. j.
Pulv. Zingib. (Powdered Ginger)	gr. j.

Mass the sulphide and the salicylic acid separately with paraffin ointment, mix, and add the ginger. If syrup, glucose, or any ingredient containing water is added, the sulphide will be decomposed, hydrogen sulphide being evolved.

℞ Calcii Chlorid. (Calcium Chloride)	gr. iij.

Calcium chloride is very deliquescent—that is, it absorbs water. Hence it must be massed with a fat. Resin ointment and paraffin ointment both answer well. The pills should be sent out in plenty of dry powder, preferably talc.

Chian turpentine pills are not often prescribed now, although at one time they had a great vogue—

℞ Tereb. Chiæ (Chian Turpentine)	gr. iij.
Sulph. Sub. (Sublimed Sulphur)	gr. ij.

Mix the ingredients in a very hot mortar and mass with the aid of a trace of absolute alcohol. Roll quickly.

℞ Acid. Carbolic. (Carbolic Acid)	gr. j.
Ext. Nucis Vom. (Extract of Nux Vomica)	gr. ⅛
Pulv. Zingib. (Powdered Ginger)	gr. j.

Take two grains of the 50-per-cent. carbolic pill-mass, made according to the formula on page 105, add the other ingredients, and mass. Varnish the pills.

℞ Creosoti (Creosote)	♏j.
Ext. Bellad. (Extract of Belladonna)	gr. ¼
Pulv. Rhei (Powdered Rhubarb)	gr. ij.
Ext. Cascaræ (Extract of Cascara)	gr. j.

Melt half a grain of hard paraffin, add the creosote, mix; add the two powders and mass.

℞ Creosoti (Creosote)	♏j.
Zinci Valer. (Zinc Valerianate)	gr. ij.
P. Asafetidæ (Powdered Asafetida)	gr. j.

Mix the valerianate and asafetida with one grain of wheat flour and incorporate the creosote.

℞ Butyl-Chloral. Hyd. (Butyl-Chloral Hydrate)	gr. iv.
Ext. Nucis Vom. (Extract of Nux Vomica)	gr. ¼

Powder finely, add the extract, and mass with glucanth.

℞ Sodii Bicarb. (Sodium Bicarbonate)	gr. ij.
Ferri Sulph. (Ferrous Sulphate)	gr. ij.
Ext. Aloes (Extract of Aloes)	gr. ½
Ol. Anthem. (Oil of Chamomile)	♏⅛

See that the solid ingredients are in very fine powder. Mix them in a warmed pill-mortar. Allow a little time to elapse for the reaction to finish, add the oil, and mass with a little compound powder of tragacanth. This is a modification of Dr. Blaud's pill, and contains ferrous carbonate.

℞ Phosphori (Phosphorus)	gr. $\frac{1}{32}$
Ext. Nucis Vom. (Extract of Nux Vomica)	gr. $\frac{1}{4}$
Ext. Belladonnæ (Extract of Belladonna)	gr. $\frac{1}{4}$
Ext. Damianæ (Extract of Damiana)	gr. j.
Ext. Aloes (Extract of Aloes)	gr. $\frac{1}{2}$
Oleo-resin. Zingib. (Oleo-resin of Ginger)	gr. $\frac{1}{8}$

The foregoing is a common prescription in certain districts. The best plan is to take a piece of phosphorus out of the water under which it is stored, by means of a sharp-pointed knife, dry it, and weigh off the requisite amount. This is dissolved in a mortar, in a few drops of carbon disulphide, one grain of kaolin, and a quarter-grain of hard paraffin added, and triturated until the solvent has disappeared. The rest of the ingredients must then be incorporated as rapidly as possible, finally varnishing the pills.

Instead of proceeding as above, if 10-per-cent. phosphorated suet (as described on page 108) is at hand $\frac{5}{16}$ ($\frac{10}{32}$) grain of this may be used for each pill.

SUPPOSITORIES

The name *suppository* is given to a solid preparation of conical shape intended for the introduction of medicaments into the rectum. Similar preparations for the vagina are known as *pessaries*, while those for the nose and urethra are termed *bougies*. As the usefulness of these preparations is entirely dependent upon their melting completely at the temperature of the body, care must be exercised in the selection of the basis with which they are to be compounded. The suppository bases in general use are oil of theobroma, and a combination of gelatin and glycerin; others have been proposed, such as stearin, and a mixture of stearic and oleic acids; while in the 1885 edition of the Pharmacopœia, curd soap massed with glycerin of starch was employed. Of these, oil of theobroma is the most useful; although melting below 35° C., it is sufficiently firm to be handled at the ordinary temperature, while its non-irritating nature pre-eminently adapts it for internal application.

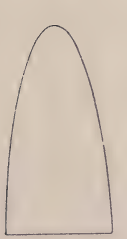

Fig. 70.
Rectal Suppository.

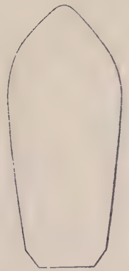

Fig. 71.
Rectal Suppository.

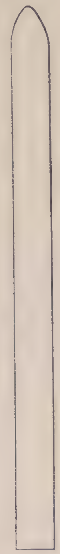

Fig. 72.
Nasal Bougie.

The usual shape of rectal and vaginal suppositories is that of a cone with a rounded apex (fig. 70). Besides this, there is the torpedo form (fig. 71), which is supposed to be more readily retained in the rectum. The weight of rectal suppositories is officially fixed at fifteen grains, although in practice they are often made to exceed it, while pessaries vary from thirty to one hundred and twenty grains. Pencil-shaped bougies for the nose (fig. 72) weigh about thirty grains, and are usually four inches in length, those for the urethra being a little longer.

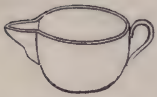
FIG. 73.—CAPSULE.

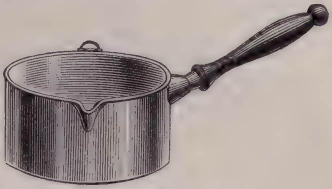
FIG. 74.—SUPPOSITORY-BATH.

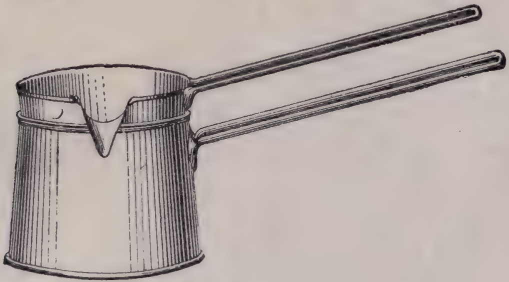
FIG. 75.—TIN SUPPOSITORY-BATH.

Convenient dishes for melting the ingredients are the porcelain capsules with handles, sold by the chemical apparatus makers (fig. 73), although small water-baths of the shapes shown in figs. 74 and 75 are sometimes preferred.

Metal moulds stamped 'fifteen,' 'twenty,' 'thirty,' 'sixty,' and 'one hundred and twenty grains' are in common use; these open in different ways, but preference should be given to those opening vertically, so as to expose the whole length of the suppositories (figs. 76 and 77).

Theobroma suppositories.—These may be considered under three heads:

(*a*) Suppositories containing small quantities of medicaments, as alkaloids and their salts.
(*b*) Suppositories containing insoluble substances of high gravity, as mercuric oxide, iodoform, &c.
(*c*) Suppositories containing extracts.

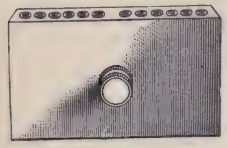

FIG. 76.
BOUGIE-MOULD.

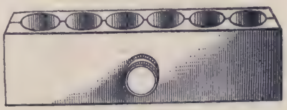

FIG. 77.
SUPPOSITORY OR PESSARY MOULD.

(*a*) The suppositories belonging to this class present little difficulty. The theobroma should be cut small and melted at as low a temperature as possible. The medicament, *having been powdered very finely* or dissolved in a few drops of water (or, in the case of alkaloids, oleic acid), is mixed with a portion of the melted fat on a slab. When the remainder of the fat in the dish shows signs of thickening, the medicated portion is stirred in and the mixture poured into the moulds, stirring being continued all the time.

(*b*) The theobroma is melted as in (*a*), and a small quantity poured on to a slab. With this, *the medicament in very fine powder* is thoroughly mixed by means of a flexible spatula. More warm theobroma is added a little at a time until about half has been used. The medicated portion is next transferred to the dish and the whole diligently stirred. If the proper degree of heat has been employed, the mixture just before pouring will be of the consistence of thick cream, and will solidify before the suspended powder has time to settle. If the mixture has been poured into the moulds at too high a temperature, the medicament will in all probability separate, and be found in a hard lump at the apex of each suppository.

(*c*) The preparation of suppositories containing extracts is somewhat more difficult, and requires care in the management of the heat. The theobroma is cut small, melted at a very low temperature, and a portion poured out on a slightly warmed slab. The extract, previously softened by rubbing with a little water or alcohol, according to its nature, is thoroughly mixed with this, the theobroma being added by degrees until a perfect mixture results. This is then transferred to the dish and warmed *very slightly*, stirring the whole time, not being poured into the moulds until almost at the point of solidification.

When very large quantities of extracts are introduced, the addition of a little gelatin is advantageous. Thus:

Extract of Henbane	60 grains
Oil of Theobroma	a sufficiency

For twelve suppositories, fifteen grains each.

Place the extract in a small dish with three grains of gelatin (previously softened with water) and warm gently. As the gelatin melts, mix, and gradually add the melted but nearly cool theobroma, stirring constantly. The mixture, which should be of a creamy consistence, is then poured into the moulds.

When considerable quantities of *liquids* have to be introduced into theobroma suppositories, as liquid extract of witch hazel, adrenalin solution, &c., the following plan is good :

When the liquid medicament may be heated without injury, it is warmed with about 2 per cent. of sodium stearate and allowed to cool. The melted oil of theobroma is next added, and the whole stirred until emulsified.

In the case of liquids injured by great heat, the sodium stearate may be melted with a little water, the medicament incorporated, and finally the oil of theobroma.

General remarks.—As there is always some waste in suppository-making, due to small quantities adhering to the dish, it is advisable to make one or two extra, so as to ensure turning out the required number.

To prevent the suppositories adhering to the mould the latter should be lubricated by wiping with a plug of cotton damped with solution of soft soap (5-per-cent.) in alcohol. Only the smallest quantity should be used, or the suppositories, instead of coming out smooth and glossy, will have a mottled appearance.

In hot weather the moulds should be placed in cold water or on a block of ice, so as to ensure rapid solidification.

Stearin suppositories.—Cocoanut stearin has been suggested as a basis for suppositories. Its melting-point is about 29° C.—considerably lower than that of oil of theobroma—thus rendering it somewhat more difficult to handle in warm weather. The chief drawback is its tendency to become rancid. It may be used in precisely the same way as oil of theobroma.

Gelatin suppositories.—Gelatin is principally used as a basis for glycerin suppositories,[1] the formula adopted by the Pharmacopœia being as follows:

Gelatin	14 parts by weight
Glycerin	70 ,, ,,
Water to produce	100 ,, ,,

Allow the gelatin to stand with the water in a covered vessel, turning over occasionally until evenly moistened. Heat the glycerin to about 90° C., and pour on to the gelatin. Stir gently, avoiding the formation of bubbles, allow to stand for two or three minutes, remove any scum that rises, and pour into slightly oiled moulds.

Salts, extracts, and other freely soluble substances are dissolved in a portion of the water, and added to the melted gelatin. Tannic acid requires different and very careful treatment. If dissolved in water and added to the gelatin direct, it causes immediate precipitation. It has, however, been observed that *if the tannin is dissolved in the water in which the gelatin is allowed to soak,* no difficulty is experienced so long as the amount does not exceed 7 or 8 per cent., such suppositories readily dissolving in water heated to 35° C.

---

[1] Another formula for glycerin suppositories is as follows:

Glycerin	88·20
Sodium Carbonate	4·37
Stearic Acid	7·43

The gelatin basis for *pessaries* is usually somewhat less firm than that required for suppositories, 10 per cent. more water being added. *Bougies,* on the other hand, require a firmer basis—

Gelatin	18 parts by weight
Glycerin	20 „ „
Water	62 „ „

Urethral bougies of extra length and rigidity are occasionally prescribed. These are made with the last-mentioned basis, threaded on fine silk, and left to evaporate in a warm place free from dust until of the required consistence. Moulds for bougies six to eight inches long may be made by wrapping tinfoil round a perfectly smooth and tapering penholder, afterwards supporting the shell in a box of *warm* sand. Should any irregularities appear when the foil is stripped, the bougies should be rapidly dipped in a vessel containing hot water.

Sending out of suppositories.—Suppositories should be sent out in partitioned boxes; failing this, they may be packed in shallow boxes lined with waxed paper. The practice of wrapping them singly in tinfoil is not recommended, as ignorant persons might omit to remove the covering, which, moreover, often adheres in an annoying manner.

Large quantities of suppositories are made by compression. Although the finish is not quite so good as when made by casting in moulds, there is great saving of time. In addition, by incorporation in the cold, it is possible to exhibit certain medicaments, such as chloral hydrate, which cannot be prepared by melting in the ordinary way. The grated theobroma is placed in a mortar and the medicaments kneaded in exactly as for a pill-mass. Solid ingredients must be reduced to impalpable powder. Extracts should be mixed with a portion of the theobroma first.

The machine shown in fig. 78 is furnished with moulds for making both suppositories and bougies.

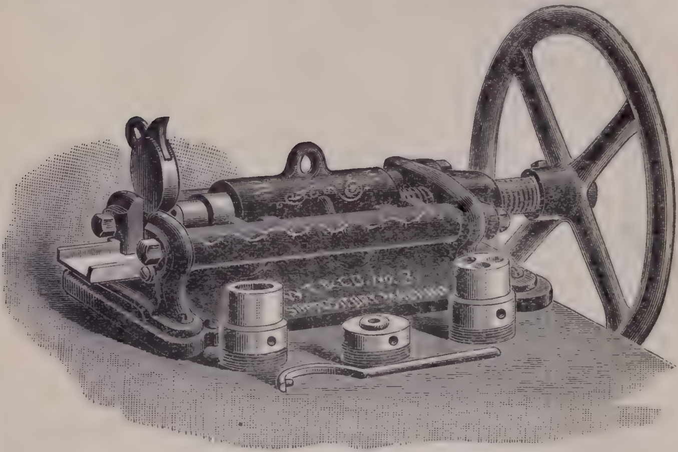

FIG. 78.—SUPPOSITORY-MACHINE.

The medicated mass is placed in the cylinder, a mould attached, and the cylinder fixed in position with the end of the mould resting against the movable plate at the end of the machine. The mass is then compressed and forced into the moulds by turning the wheel, which forces the plunger into the cylinder. The end plate is next removed, when a slight turn of the wheel forces the finished suppositories out upon the tray, the operation being repeated until all the mass has been used.

Examples of combinations:

℞ Cocainæ (Cocaine)	gr. ¼
Morphinæ (Morphine)	gr. ¼
Ol. Theobrom. ad (Oil of Theobroma to)	gr. xv.

For one suppository. Powder the alkaloids and add them to two grains of oleic acid in a small dish. Warm gently, and dissolve the oleates thus formed in the theobroma.

℞ Ext. Belladon. Virid. (Green Extract of Belladonna)	gr. ½
Ol. Theobrom. ad (Oil of Theobroma to)	gr. xv.

For one suppository. Treat according to either of the methods previously described for soft extracts.

℞ Cocainæ Hydroch. (Cocaine Hydrochloride)	gr. ½
Adrenalin 1–1000 (Sol. of Adrenalin 1 in 1000)	♏ij.
Ol. Theobrom. ad (Oil of Theobroma to)	gr. xv.

For one suppository. Dissolve the cocaine hydrochloride in the solution and add to the melted but nearly cold theobroma; stir constantly whilst pouring.

OINTMENTS

The dispensing of ointments may be considered under two heads: (*a*) those requiring melting and (*b*) those which may be mixed in the cold.

(*a*) Ointments requiring the application of heat generally have for a basis a mixture of lard, soft paraffin, or oil, with some solid of higher melting-point, as beeswax or hard paraffin. The melting of the solid portion does not present any difficulty, but no more heat should be used than is necessary to effect liquefaction. If powders are to be incorporated they should be ground to fine powder and sifted on to the mixture just when it begins to thicken, and the whole stirred until cold, any volatile ingredient being added towards the end.

On no account should melted ointments be transferred to cold vessels, or a lumpy ointment, due to sudden solidification of the waxes, if present, will be the result. Generally it is better to effect admixture in the vessel used to melt the ingredients, *but if for any reason it is found necessary to use a mortar, it must first be heated, by means of boiling water, to a point above that at which any portion of the basis will solidify.* If hot water is not at hand and the mortar is not of large size, many dispensers pour in a little alcohol and set light to it, rotating occasionally so as to warm the mortar evenly.

(*b*) As a rule most of the ointments prepared at the dispensing-bench are made in the cold, from such stock-bases as lard, soft paraffin, &c. When the quantity does not greatly exceed one or two ounces it is customary to employ a slab and broad-bladed spatula. Preference should in all cases be given to steel spatulas, bone or vulcanite only being used when the medicaments are likely to have any action on steel. For quantities over two or three ounces a mortar should be used.

Considerable dexterity is required to make an ointment neatly and quickly on a slab, and the student is recommended to practise with inexpensive materials until proficiency is attained. The slab itself should be of good size, certainly not less than twelve inches square; the spatula, which must be flexible, may be about eight inches long in the blade and 1¼ or 1½ inches wide. It is used with a regular side-to-side and not rotary motion, the blade being kept as flat as possible the whole time. The spatula must be cleaned by the aid of another, and not by scraping it against the edge of the slab; in fact, the ointment should be kept near the middle, and not be allowed to work towards the edge at all.

Incorporation of insoluble powders.—To secure a perfectly smooth ointment it is necessary to add powders in a state of minute subdivision, sifting them if necessary through a sieve or a piece of muslin stretched over a tinned metal ring. In most cases it is advantageous to mix the powders with a small portion of the basis first, the remainder being added by degrees.

Incorporation of crystalline substances.—When the proportion of medicament is very small it is customary, where possible, to add it to the basis in solution. Cocaine hydrochloride, atropine sulphate, and similar salts should always be dissolved in water before incorporation. Alkaloids may be either dissolved in a little 90-per-cent. alcohol or combined with sufficient oleic acid to effect solution.

Incorporation of extracts.—Ointments containing 10 or even 20 per cent. of vegetable extracts are frequently met with, and are always made in the cold. If the basis has to be specially made by melting, it must be allowed to become nearly cold before mixing with the extract; if the latter is at all hard or lumpy, it should be softened with a little warm water or alcohol, according to its nature, and added to a portion of the basis a little at a time. Glycerin should never be used to soften hard extracts, whether for ointments or suppositories.

Incorporation of liquids.—Cold cream is an excellent type of an ointment containing a large amount of liquid. The rose-water, which should be warmed to about 33° C., is stirred or whipped in just when the melted fats show signs of congealing. Admixture may be effected in a warm mortar, either by means of a whisk, such as is used for whipping cream, or with an ordinary pestle. It is important not to add liquids too quickly or the greater part will separate again as the ointment cools. After all the liquid has been added, stirring should be continued until the ordinary temperature has been regained, and a perfectly creamy product results.

Ointments containing lanolin take up a relatively large proportion of aqueous liquid, especially if admixture is effected in a warmed vessel. They possess, however, the disadvantage of turning brown on the surface when exposed to the air, owing to loss of water by evaporation. Tinctures and spirits are often prescribed in ointments; these may be stirred into almost any basis, care being taken not to add too much at one time.

Liquids—Liquor Hamamelidis, for instance—may, however, cause a good deal of trouble unless incorporated in the right way. If the ointment is rubbed in the mortar first, and the liquid added in small quantities at a time, it is surprising how much will be taken up; but if, on the other hand, ever so little of the liquid is placed in the mortar first, and the ointment added, no amount of coaxing will induce combination. Thus:

℞	Liq. Hamamelidis (Solution of Hamamelis)	ʒj.
	Cocainæ Hydrochlor. (Cocaine Hydrochloride)	gr. x.
	Adip. Lanæ (Wool-fat)	ʒiv.
	Paraff. Moll. (Soft Paraffin)	ʒiv.

Place the wool-fat and paraffin in a warm mortar, mix; dissolve the cocaine in the hamamelis solution, and add by degrees to the ointment, stirring constantly.

℞ Plumbi Oleat. (Lead Oleate)	ʒij.
Paraff. Moll. (Soft Paraffin)	ʒiv.
Adip. Lanæ (Wool-fat)	ʒij.

Melt the lead oleate with the soft paraffin. Remove from the source of heat and add the wool-fat. Stir until cool.

℞ Hydrarg. Subchlor. (Calomel)	ʒj.
Hydrarg. Sulphid. (Vermilion)	gr. iv.
Ung. Paraff. (Paraffin Ointment)	℥j.

Mix the two powders with a little of the paraffin; gradually add the remainder.

℞ Cocain. Hydrochlor. (Cocaine Hydrochloride)	gr. x.
Morph. Hydrochlor. (Morphine Hydrochloride)	gr. iv.
Ung. Aq. Rosæ (Cold Cream)	ʒiv.
Adip. Lanæ Hydros. (Wool-fat)	ʒiv.

Dissolve the salts in half a drachm of warm water, and add to the lanolin. Mix well and incorporate the cold cream.

℞ Ext. Hamamelidis Liq. (Liquid Ext. of Hamamelis)	ʒij.
Ext. Belladon. Vir. (Green Ext. of Belladonna)	ʒss.
Ung. Lanæ Co. (Wool-fat Ointment)	℥j.

Place the ointment in a slightly warmed mortar, and add by degrees, constantly stirring, the mixed extracts.

℞ Morphinæ Hydrochlor. (Morphine Hydrochloride)	gr. iij.
Cocainæ Hydrochlor. (Cocaine Hydrochloride)	gr. x.
Acid. Gallic. (Gallic Acid)	gr. xl.
Adip. Benz. ad (Benzoated Lard to)	℥j.

Dissolve the alkaloidal salts in a little water, and add to the lard, with which the gallic acid has been previously incorporated. Do not use a steel knife, or the ointment will be blackened.

℞	Liq. Picis Carbonis (Solution of Coal-tar)	♏xx.
	Liq. Plumbi Fort. (Strong Solution of Lead)	ʒj.
	Acid. Carbolic. (Carbolic Acid)	gr. v.
	Crem. Lactis (Fresh Cream)	℥j.

Add the lead solution to the cream in a mortar, stirring constantly. Dissolve the phenol in the coal-tar solution, and incorporate by degrees.

PLASTERS

In the preparation of this class of remedies for local application, emollient or stimulating substances are mixed with various medicaments in such proportions that the resulting mixture, although stiff at ordinary temperatures, will, when spread in a thin layer on calico, leather, or other material, be rendered adhesive and flexible by the warmth of the body. The Pharmacopœia enumerates a fairly long list of plasters, the greater number of which contain lead plaster as a basis. Of late years plasters of this class have fallen into partial disuse, their place having been taken by plasters having a basis of rubber.

Some plasters are merely intended to afford support to the parts of the body to which they may be applied, while others are medicated so as to act as vesicating, stimulating, or anodyne applications. The spreading of plasters is an operation connected with the dispensing of medicines which requires some skill and experience; for this reason the beginner is recommended to practise by spreading some inexpensive plaster, as Emp. Resinæ, on brown paper until a fair amount of dexterity is acquired, when a trial may be made on leather.

Plasters are generally spread on the *rough* side of sheep-skin (plaster-leather), but are sometimes required on wash-leather, calico, silk, or swansdown; if the last is employed the plaster is spread on the smooth side. When a plaster is ordered in a prescription, the size and shape are usually indicated; occasionally the part is named to which the plaster is to be applied, and the determination of the size and shape left to the judgment of the dispenser. There are certain shapes which are generally adopted for application to particular parts of the body, and, in the absence of specific instructions, the dispenser should conform to the recognised practice in this respect. Thus, fig. 79 represents the form of plaster usually applied to the chest; fig. 80, that for application between the shoulders; fig. 81, that for the small of the back; fig. 82 is the form adopted for the side; fig. 83, for applying behind the *left* ear; fig. 84, for the *right* ear; fig. 85 represents a breast plaster. It will of course be understood that these figures represent the forms, and not the relative sizes, of the respective plasters.

Blisters for applying to the back of the ear are invariably spread on adhesive plaster; all others, unless otherwise directed, on ordinary white plaster-leather. It is customary to leave a margin of unspread leather around all plasters. For ordinary sizes a margin of one inch is considered sufficient, but for very small plasters the margin may be reduced to half an inch, or even a quarter of an inch.

When about to spread a plaster—say, of belladonna for the small of the back, ten inches by six inches—a piece of leather is selected free from flaws and about three inches larger each way than the specified size. A few sheets of thick brown paper are laid on the bench to prevent the heat being conducted away too rapidly during the operation. On this the leather is laid and smoothed by ironing with a moderately hot spatula. To prevent the leather from soiling, it should be protected

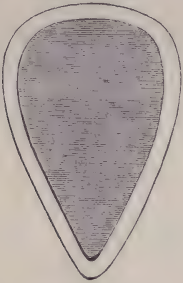

Fig. 79.

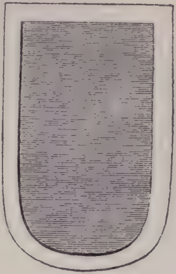

Fig. 80.

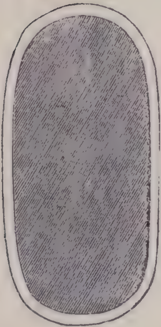

Fig. 81.

Fig. 82.

by a piece of paper whilst being ironed smooth. If too much pressure or heat is employed at the beginning, the leather will wrinkle, when no amount of extra ironing will flatten it out again. The use of the sheet of paper during the ironing process is an extra safeguard, for, if too great a heat is used, the paper will show signs of scorching before the leather is much harmed.

Cutting the shape.—The leather having been prepared, a piece of paper—say, fourteen inches by ten inches—is folded equally across its longer diameter, and again across its shorter diameter. Five inches are next measured off (on the quarter-sheet) in the longer direction, and three inches in the shorter, and the inside cut out as shown in fig. 86. Very accurate shapes may be cut if a pencil line is first ruled as a guide, the rounded corners being made equal by placing a small coin in the angles and drawing the curves around it. The paper

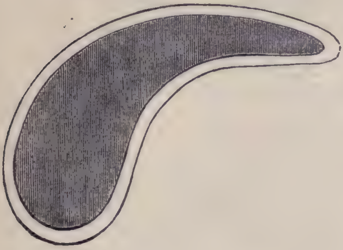

FIG. 83.

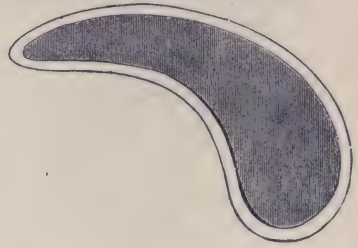

FIG. 84.

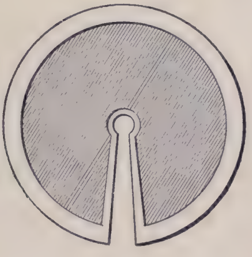

FIG. 85.

margin is then soaked for a few seconds in water, excess of water removed by blotting-paper, and pressed evenly on the leather. The practice of smearing the paper margin with soft soap to make it adhere is not recommended, as the soap discolours the leather.

The next step is to melt the plaster. The time-honoured way was to press the roll of plaster against the hot iron, allowing the melted medicament to collect on a piece of paper, from which, as soon as sufficient had collected, it was transferred to the leather. Experience, however, has taught that it is preferable to take a weighed quantity of plaster (about ten grains to the square inch), and melt it, with the least possible heat, in a porcelain capsule over a Bunsen flame. When completely melted, the plaster is quickly transferred to the centre of the leather, and, with as little loss of time as possible, spread evenly over the surface. Spreading should commence from the middle and finish up at the margin, so that when completed the plaster should be of equal thickness over all, and the surface even and glossy. If the melted plaster is of the right temperature it will spread easily, and yet not penetrate the leather sufficiently to show through the back. The

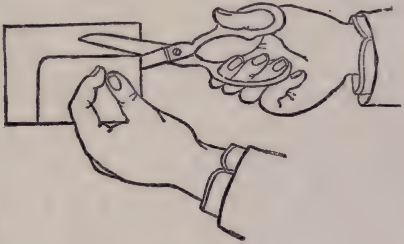

FIG. 86.

shape must be removed before the plaster sets, as, once the latter is cold, the paper leaves a broken margin when detached. As a safeguard, especially in the spreading of large plasters, it is well to have two heated plaster-irons at hand, so that, if one becomes too cool, the second may be used.

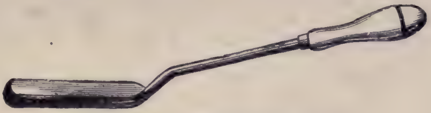

FIG. 87.—PLASTER-IRON.

The shape of the spatula or plaster-iron is not of very great importance, the usual form being that shown in fig. 87. Plaster-irons may be heated in an ordinary fire, but preferably in a Bunsen flame, as being less likely to cause injury to the blades. The exact temperature can only be learned by experience. If the application of the iron causes the plaster to smoke, the temperature is too high. Of late years an improved form of spatula (fig. 88) has come into use, consisting of a hollow iron of the usual shape, provided on its upper surface with a number of small holes and connected, by means of a flexible tube attached to the handle, with the gas-supply. The amount of heat can be regulated to a nicety by increasing or decreasing the size of the gas jets, and, in the hands of those accustomed to its use, this tool is of great utility.

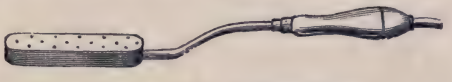

FIG. 88.—GAS PLASTER-IRON.

Plasters with adhesive margins (fig. 89).—Certain plasters which possess little or no sticking power of themselves require the addition of an adhesive margin to ensure their remaining fixed to that part of the body to which they are applied. Supposing a plaster of this description, six inches by three inches, is required, the usual procedure is as follows: A suitable piece of leather having been selected, a *paper shape* enclosing a space, say, eight inches by five inches is cut, and made to adhere to the leather by moistening. A little adhesive plaster (Emp. Resinæ), having been melted in a small dish, is poured on the leather close to the paper edge, and a margin of about two inches spread all the way round. The paper shape is next removed, and the plaster left to cool. When sufficiently hard, a second shape, enclosing a space six inches by three inches, is cut from *waxed* paper, and laid on the leather in such a way that an even margin of adhesive plaster is left all round. The second shape must be sufficiently broad to cover not only the adhesive margin, but the plain leather one. All being ready, the centre of the leather is next spread with the medicated plaster, and the paper stripped off. When the shape is removed it will

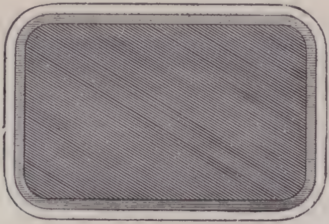

FIG. 89.—PLASTER WITH ADHESIVE MARGIN.

probably be found that the surface of the adhesive margin appears somewhat dull where the paper was pressed on to it, but the dulness at once disappears if the finished plaster is passed rapidly, face downwards, over a Bunsen flame.

Breast-plasters (fig. 85).—These plasters should be spread on either 'split skin' or 'wash-leather.' More difficulty will be experienced in spreading a plaster on these than on ordinary sheep-skin, on account of the liability to stretch and pucker. To obviate this tendency, the leather should be first stretched moderately tightly and then tacked down, over several sheets of brown paper, to a piece of smooth board; on no account should the leather be tacked down to the bench, as the position requires to be constantly varied during spreading. The melted plaster must not be poured directly on to the leather, but on to a piece of brown paper, and only pushed on to the leather when it begins to cool. In fact, too much care cannot be exercised in regulating the heat both of plaster and iron, as if the temperature is allowed to rise too high, a discoloured plaster will be the result.

Sending out of plasters.—Plasters should be sent out in shallow cardboard boxes, the plaster being fastened down at each end by one of the small brass clips used for securing documents, the ends of the clips being turned back outside the bottom of the box.

Blisters.—Blisters are spread on ordinary adhesive plaster on unglazed calico. Besides those intended for the back of the ear (figs. 83 and 84), square and circular blisters are frequently prescribed for application to the temple and other parts. As a guide in arriving at the correct shapes for ear-blisters, bend the forefinger of the left hand, and allow it to touch the top of the thumb; the figure formed will give a fair idea of the proper form of blister for the left ear (fig. 90). If the same is done with the right hand it gives the shape for the right ear. For blisters it is not necessary to leave so wide a margin as for other plasters, an eighth of an inch being ample. The cantharides plaster of the Pharmacopœia partakes more of the nature of a cerate than of a plaster, and can be easily spread without warming by means of a flexible knife, particularly if it has been rubbed down on a slab previous to spreading. Some dispensers are in the habit of sprinkling blisters with finely powdered cantharides, others of painting the blister with Liquor Epispasticus, with the idea of in-

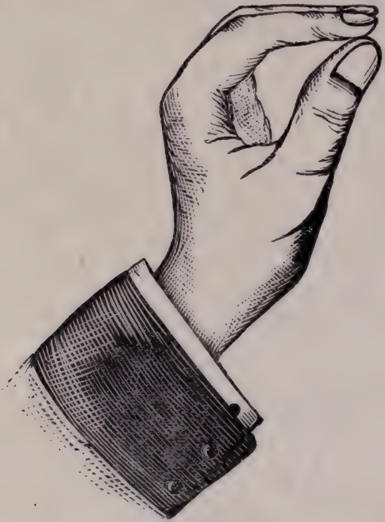

FIG. 90.

creasing the vesicating action, but such practices are not warranted.

TABLET TRITURATES

This name is applied to small friable tablets composed of medicated milk-sugar. The mould (fig. 91) may be of vulcanite, and consists of two parts: an upper plate perforated with holes—generally fifty—the size of the tablet required, and a second plate carrying a number of smooth upright pegs, exactly corresponding with the holes in the upper plate, and used to displace the finished tablets.

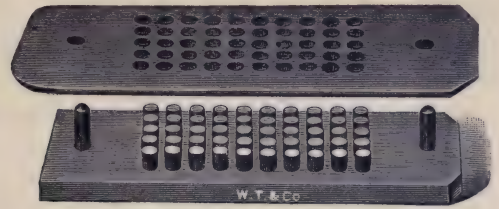

FIG. 91.—TABLET-TRITURATE MOULD.

The first operation is to ascertain the exact content of each hole. This is done by moistening finely powdered milk-sugar with 60 per cent. alcohol, and pressing the pasty mass into the holes. The tablets are at once forced out by means of the pegs, dried, and weighed. As a rule each tablet will be found to weigh about one and one-third grains, but the total weight must be carefully noted. Suppose the total weight to be sixty-five grains, and fifty tablets are required each containing $\frac{1}{10}$ grain of cocaine hydrochloride. In the first place allowance must be made for loss, and it will be necessary to calculate for, say, sixty tablets; so that if fifty tablets weigh sixty-five grains, sixty will weigh $\frac{65 \times 60}{50} = 78$ grains. And of this $60 \times \frac{1}{10} = 6$ grains will be cocaine hydrochloride, therefore the amount of sugar of milk required will be $78 - 6 = 72$ grains.

All that is necessary is to triturate the two powders until thoroughly mixed, moisten slightly with 60 per cent. alcohol and press into the moulds.

The excess should weigh exactly thirteen grains if collected and dried.

If the active ingredient is a liquid, it must be intimately mixed with the requisite quantity of milk-sugar and evaporated to dryness. Extracts should be dissolved in the smallest possible quantity of water or spirit, according to their nature, and distributed through the milk-sugar as described for liquids. It is important that the milk-sugar be in the finest possible powder, or the tablets will be too friable to keep their shape when dry. The most useful excipient is 45 or 60 per cent. alcohol, but the selection is governed by the nature of the medicament.

In practice it is found advantageous to lubricate the tops of the pegs by spraying them with a solution of one part of liquid paraffin in one hundred parts of ether. The tablets should be pressed from the mould soon after making, as if left too long they cannot be detached without crumbling.

Example :—

℞ Strychnin. Hydroch. (Strychnine Hydrochloride)	gr. j.
Pulv. Ipecac. (Powdered Ipecacuanha) . .	gr. L.
Ol. Carui (Caraway Oil)	gtt. iv.

For fifty tablet triturates. If the capacity of the mould is sixty-five grains, take ten grains of milk-sugar and grind it thoroughly with the strychnine. When mixed, add the ipecacuanha and volatile oil; mix, add a few drops of 60 per cent. alcohol, mix rapidly, and squeeze into the holes.

PASTILLES

Of late years pastilles prepared with a basis of glyco-gelatin have come into general use, and this is not to be wondered at considering the ease with which twelve or twenty-four pastilles can be turned out for the filling of any special prescription. The *Glyco-gelatin* basis is made as follows:

Gelatin	12 ounces
Glycerin	24 ,,
Distilled Water	30 ,,
Oil of Orange-peel	10 minims

Allow the gelatin to soak in the water until softened; dissolve by the aid of a water-bath; add the glycerin and, when nearly cool, the oil of orange-peel. Pour out into a flat mould, and when quite cold divide into one-inch squares for convenience in weighing.

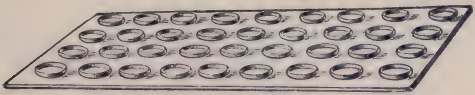

FIG. 92.—PASTILLE-MOULD.

Example.—Supposing twenty-four pastilles are required each containing one-eighth grain of cocaine hydrochloride: First ascertain the capacity of the moulds, similar to fig. 92. Suppose it to be sixty grains; then as allowance must be made for waste calculate for a slightly larger number which will require a weighable quantity of active ingredient—say twenty-eight in this case. The amount of cocaine hydrochloride required will be $28 \times \frac{1}{8} = 3\frac{1}{2}$ grains. Dissolve this in the correct amount of melted basis and pour into the moulds.

If the tray is set in a cool place, solidification takes place in a few minutes, when, if the moulds have been *slightly* oiled, the pastilles may be turned out smooth and bright, and ready for sending out.

CAPSULES

Gelatin capsules are largely used for the administration of nauseous drugs both in the solid and liquid form. Empty shells of soft gelatin may be procured from the manufacturers ready for filling, or they may be prepared by dipping slightly oiled olive-shaped moulds (fig. 93), fixed on a frame, into a solution of gelatin, allowing excess to drain off, and rotating slowly until the gelatin sets in an evenly distributed coat. When cold a knife is passed round the neck of the mould, and the shells are gently detached and placed in supports to dry.

When ready for filling, the capsules are placed in convenient supports (an ordinary suppository-mould answers well for small quantities) and the liquid is introduced by means of a syringe with a long fine nozzle. If any oily fluid touches the neck of the shell it must be wiped off before attempting to seal, or a leaky capsule will be the result. There are several methods in use for closing the capsule; the most convenient is to touch the opening with a camel-hair brush charged with thick gelatin solution.

Experience shows that it is a most impossible to keep the hand perfectly steady when filling capsules, and a device similar to fig. 94 is found useful. A rigid and heavy stand supports the syringe, the capsules being pushed under the nozzle one by one. It is essential that the piston of the syringe should fit the barrel accurately and yet sufficiently easily to move without jerking.

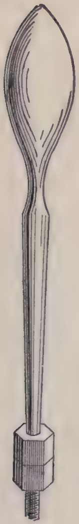

FIG. 93.
CAPSULE-MOULD.

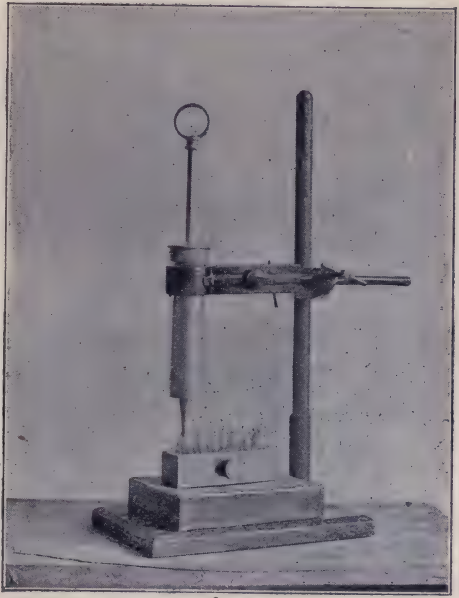

FIG. 94.—CAPSULE-FILLING.

The following is a good working formula for the gelatin solution :

Gelatin	16 ounces
Glycerin	12 ,,
Water	22 ,,
Syrup	8

Hard gelatin capsules (fig. 95) are occasionally used for dispensing powders and pastes. They may be made if desired by dipping cylindrical iron moulds, one mould being slightly larger than the other, into a solution of gelatin made as follows:

Gelatin	6 parts
Gum Acacia	1 part
Sugar	1 ,,
Water	6 parts

draining, cooling, and detaching as described for *soft* gelatin capsules. The shells are afterwards dried in a current of warm air until perfectly hard. To use, the smaller half is filled with the medicament and the cap slipped over the end. Various devices have been introduced for the expeditious and cleanly filling of these hard capsules. In no case should the capsule be filled by simply pressing into a heap of the powder. With bitter drugs such as quinine, no matter how carefully the capsule is afterwards wiped, the taste will be perceptible as soon as placed in the mouth.

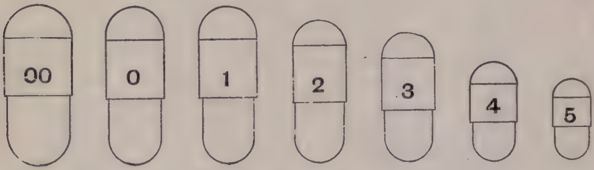

FIG. 95.

The most convenient method is to place the empty shells in holes sunk in a block of wood, introducing the medicament by means of a small funnel and plunger (fig. 96). With ordinary care it is quite possible to fill the capsules without getting any of the drug on the outside. If desirable the inner edge of the cap can be painted with a little mucilage before slipping on, and the contents hermetically sealed.

There are several drugs and compounds the capsuling of which presents a little difficulty. The following short list of the capacities of these capsules may be helpful in selecting the appropriate size :

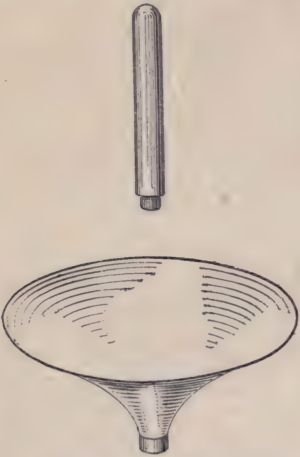

Fig. 96.—Capsule-filler.

—	Size of Capsule and Weight in Grains.						
	00	0	1	2	3	4	5
Bismuth Subnitrate . .	20	40	10	8	6	4	2
Dover's Powder . . Powdered Rhubarb .	12	8	6	4	3	2	1
Quinine Sulphate. . .	8	6	4	3	2	1½	¾

Creosote and guaiacol.—These are usually prescribed in one- and two-minim doses, but are always diluted with almond oil to at least five minims.

Fluid extract of cascara.—The ordinary dose in a capsule is thirty minims. If the extract is simply evaporated to a pasty consistence and then filled into soft capsules, the latter soon shrink and become unsightly. To avoid this, a proportionate quantity of the dry extract should be reduced to fine powder and mixed with vaseline or liquid paraffin.

Blaud's pill capsules.—Dry the alkali perfectly and mix with soft white paraffin. Powder the ferrous sulphate, dry at 100° C., and also mix with soft paraffin; then mix the two together and capsule as rapidly as possible.

Folding capsules consist of very thin sheets of gelatin, and may be used in a similar manner to wafer papers for covering nauseous powders and confections. They are especially useful when the dose is too great for an ordinary capsule. The powder is placed in the centre of a sheet, the edges turned over and secured by moistening with water or mucilage. The gelatin sheets may be prepared by pouring a very thin film of gelatin solution (gelatin 25, water 60, glycerin 1) into a shallow tray, allowing it to set, and then detaching and hanging up to dry. The films should be cut into sheets two and a-half inches wide and three inches long.

AMPOULES

Of recent years sterile solutions for hypodermic injection have been in great demand. It may be that only a few drops are required each time but it is imperative that the drops shall always be absolutely sterile. It is obvious that a one-ounce stoppered bottle containing the solution will not answer, since each time the bottle is opened there is the certain risk of infection.

To meet this demand the practice has grown up of supplying sufficient for one dose only in a little bottle or flask known as an 'ampoule.'

These vary in size from 1 c.c. to 5 c.c. The exact capacity is of no account so long as they hold *rather* more than is required for the injection. These solutions usually contain a very active or toxic body readily decomposed by alkali, and it is essential that the ampoule shall be made of best *neutral* glass.

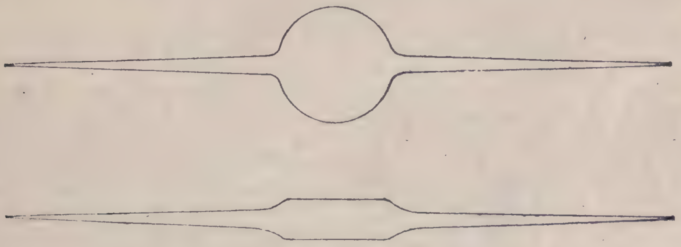

FIG. 97.

If the solution is likely to be affected by light the ampoule should be of *amber* glass.

In preparing the solution particular attention must be paid to obtaining it in as bright a condition as possible. Various methods have been suggested for filling and sterilising the ampoules; but disregarding those which require special apparatus, the following may be considered :

(a) *Substance Unaffected by Heating to 100° C.*

The solution is prepared in the ordinary way in a boiling tube or long narrow beaker, and after straining through cotton-wool (to remove floating particles) the ampoules, one end of which has previously been snapped off, are placed with the open end downwards in the solution, a clock glass being placed over the beaker to prevent loss by evaporation as far as possible. The beaker is then heated slowly so that by the time the boiling-point of the solution is reached nearly all the air in the ampoules will have been expelled. The beaker is then set aside to cool and as this takes place the liquid is drawn up into the ampoules. They are then removed one by one and the open ends quickly sealed in the blow-pipe flame.

If the ampoules were previously sterilised the operation is now finished. If not, they may be placed in a beaker of water and boiled for ten to fifteen minutes.

(b) *Substance Decomposed by Heat.*

The empty ampoules must first be sterilised by—(1) heating for one hour in a hot-air oven at 150° C.; or (2) boiling for ten to fifteen minutes in clean distilled water.

The solution is made under as sterile conditions as possible. The water is boiled in a boiling tube and allowed to cool with a plug of cotton-wool in the mouth.

The substance to be dissolved is quickly added, the cotton-wool replaced and the tube agitated until solution is effected. If necessary the solution is cleared by straining through cotton-wool, all the apparatus required having been recently sterilised. The solution is then drawn up into the barrel of a sterile hypodermic syringe, and the needle being placed in the neck of successive ampoules, the quantity required is transferred to each. The ampoules are then quickly sealed off in the blowpipe flame.

Where reduced pressure is available the following easy and quick method of filling is suitable in *all* cases:

Having prepared the solution and placed the ampoules therein, the beaker is put under a bell-jar and the air exhausted as completely as possible. This operation withdraws the air from the ampoules, as will be seen by the stream of bubbles. Then a cock is opened to allow air to re-enter the bell-jar and the increased atmospheric pressure around the ampoules forces the solution into them. These may then be removed one at a time and quickly sealed off.

Ampoules are usually packed in boxes with layers of cotton-wool.

PERCENTAGE SOLUTIONS

In dispensing, prescriptions such as the following are frequently met with:

℞ Ac. Boric. . . . . 1 per cent.
Aq. . . . . q.s. (a sufficiency)
Mitte ℥iv.

Before this can be dispensed it is necessary to understand clearly how the calculation is to be made.

Theoretically, a percentage solution is one containing a definite *weight* of active ingredient in 100 parts *by weight* (w/w) or, a definite *volume* in 100 parts *by volume* (v/v); that is, both factors must be in the same term. The resulting solutions are known as *true* percentage solutions.

Practically, a true percentage solution (w/w or v/v) is rarely intended by the prescriber. What is generally meant is a definite *weight* of active ingredient in 100 parts *by volume* (w/v).

The reason why true percentage solutions are not used in pharmacy is the fact that equal volumes of different liquids have different weights, *e. g.*

100 fl. ounces of Water (S.G. 1·000) weighs 100 oz. (avoir.) = 6¼ lb.
" " " Ether (S.G. 0·720) " 72 oz. (avoir.) = 4½ lb.
" " " Glycerin (S.G. 1·260) " 126 oz. (avoir.) = 7 lb. 14 oz.

Conversely :

100 parts by weight of Water measures 100 fl. ounces
" " " Ether " (nearly) 140 " "
" " " Glycerin " " 80 " "

Now if, for some reason, a medical man ordered for one patient—

℞ Strych. Hydrochlor.	0·1 per cent.
Aq.	ad ℥iv.

and for another the following :

℞ Strych. Hydrochlor.	0·1 per cent.
Glycerin	ad ℥iv.

we may certainly assume that it was his intention to give both patients the same dose of strychnine hydrochloride. Yet if these solutions were made up w/w, the second patient would get one-quarter as much again of strychnine hydrochloride as the first.

The rule then is :

For x per cent. solution dissolve x parts *by weight* in sufficient of the solvent to make 100 fluid parts (w/v), *i. e.* :

x grammes make up to 100 c.c.
x ounces " 100 fluid ounces
x grains " 100 fluid grains

which introduces the *bête noire* of most students—the confusion of the *minim* with the *fluid grain,* or *grain measure.*

It must never be forgotten that one minim is *not* the equivalent of one grain, as can be seen from the following:

	1 gallon of water	weighs	10 lb. (avoir.)
∴	8 pints (160 fl. ounces)	„	160 ounces (avoir.)
	1 fl. ounce	„	1 ounce (avoir.)

Then since

1 fl. ounce = 480 minims
and 1 ounce (avoir.) = 437½ grains
437½ grains = 480 minims
∴ 100 „ $= \dfrac{480 \times 100}{437\frac{1}{2}} =$ 109·7 minims
= 110 minims (approx.)

Since 1 fl. ounce of water weighs 1 ounce (avoir.) the w/w and w/v solutions are practically identical so long as water is the solvent, the discrepancy only arising when the specific gravity of the solvent differs from that of water.

The calculation for the prescription should proceed as follows:

100 fl. ounces require 1 ounce of Boric Acid
100 „ „ „ 437½ grains „ „ „
4 „ „ „ $\dfrac{437{\cdot}5 \times 4}{100}$ grains „ „
= 17½ grains „ „

ALCOHOL

Alcohol is used in a variety of ways in pharmaceutical operations. Rectified spirit of the Pharmacopœia contains 90 per cent. of ethylic alcohol by volume (85·65 per cent. by weight), and its specific gravity is

0·834. For accurately determining the percentage of alcohol in spirit the density must be ascertained by means of a specific gravity bottle and referred to an alcohol table. For Excise and general purposes, however, hydrometers are usually employed. In England the legal temperature is fixed at 51° F., the spirit being valued not according to percentage of alcohol by volume or weight, but according to the amount of 'proof spirit.' This term is defined by Act 58 George III. as being 'such as shall at a temperature of 51° F. weigh exactly $\frac{12}{13}$ of an equal measure of distilled water.' Proof spirit contains 57·09 per cent. by volume (49·3 per cent. by weight) of ethylic alcohol. Weaker spirits are termed 'under-proof,' and stronger spirits 'over-proof.' Thus 25 degrees over-proof means that 100 volumes of the spirit diluted with water yields 125 volumes of proof spirit; whilst 25 degrees under-proof means that 100 volumes contains 75 volumes of proof spirit and 25 volumes of water.

To convert percentage of alcohol by weight into percentage by volume

Rule.—Multiply percentage by weight by specific gravity and divide by 0·79367.

Example.—49·5 per cent. by weight = 57·3 per cent. by volume (49·5 × 0·920 ÷ 0·79367 = 57·3).

To convert percentage of alcohol by volume into percentage by weight.

Rule.—Multiply 0·79367 by percentage by volume and divide by specific gravity.

Example.—57·3 per cent. by volume = 49·4 per cent. by weight (0·79367 × 57·3 ÷ 0·920 = 49·4).

To convert percentage of alcohol by volume into percentage of proof spirit (Sikes).

Rule.—Multiply percentage by volume by 1·7525.

Thus, 90 per cent. alcohol by volume = 57·725 degrees over-proof (90 × 1·7525 = 157·725).

To convert percentage of proof spirit (Sikes) into percentage of alcohol by volume.

Rule.—Divide percentage of proof spirit by 1·7525.

Rules for making alcohol of any required lower percentage from alcohol of any higher percentage.

I. *By volume.*

Let the volume-percentage of the stronger alcohol be V.
,, ,, ,, ,, weaker ,, v.

Rule.—Mix v volumes of the stronger alcohol with sufficient water to produce V volumes of product. Allow the mixture to cool to 15° C., when full contraction will have taken place, and make up any deficiency with water.

Example.—Alcohol 30 per cent. by volume is to be made from alcohol 90 per cent. by volume.—Take 30 volumes of 90-per-cent. alcohol, and dilute with water to 90 volumes.

II. *By weight.*

Let the weight-percentage of the stronger alcohol be W.
,, ,, ,, ,, weaker ,, w.

Rule.—Mix w parts by weight of the stronger alcohol with sufficient water to produce W parts by weight of product.

Example.—Alcohol of 50 per cent. by weight is to be made from alcohol of 90 per cent. by weight.—Take 50 parts by weight of 90-per-cent. alcohol, and add enough water to produce 90 parts by weight.

TABLE OF COMMON SYNONYMS

Analgesine	*Phenazone*
Aqua Ammoniæ	*Liquor Ammoniæ*
Aqua Coloniensis	*Eau de Cologne*
Aqua Flava	*Lotio Hydrarg. Flava. Yellow Wash*
Aqua Fortis	*Nitric Acid*
Aqua Nigra	*Lotio Hydrarg. Nigra. Black Wash*
Aqua Vitæ	*Brandy*
Axungia	*Lard*
Balsam, Friar's	*Tinct. Benzoin. Co.*
Basilicon Ointment	*Ung. Resinæ*
Baume de Vie	*Dec. Aloes Co.*
Bitter Apple	*Colocynth*
Bitter Chips	*Quassia*
Black Draught	*Mist. Sennæ Co.*
Blaud's Pill	*Pil. Ferri*
Blue Pill	*Pil. Hydrargyri*
Blue Stone	*Cupri Sulphas*
Butter of Antimony	*Liq. Antim. Chlor.*
Cacao Butter	*Ol. Theobromatis*
Camphor Julep	*Aq. Camphoræ*
Caramel	*Sacchar. Ust. Burnt Sugar*
Carron Oil	*Linimentum Calcis*
Ceratum Galeni	*Cold Cream*
Charpie	*Lint*
Chemical Food	*Syr. Ferri Phosph. Co.*
Cinnabar	*Vermilion*
Citrine Ointment	*Ung. Hydrarg. Nitratis*
Colophony	*Resin*
Confectio Aromat.	*Pulv. Cretæ Aromat.*
Corrosive Sublimate	*Hydrarg. Perchlor.*
Cream of Tartar	*Potass. Tart. Acid.*
Deadly Nightshade	*Belladonna*
Diachylon Plaster	*Emp. Plumbi*
Donovan's Solution	*Liq. Arsenii et Hydrarg. Iodid.*
Dover's Powder	*Pulv. Ipecac. Co.*
Easton's Syrup	*Syr. Ferri Phosph. c. Quin. et Strych.*
Eau de Vie	*Brandy*
Elixir, Paregoric	*Tinct. Camph. Co.*
Elixir of Vitriol	*Acid. Sulph. Aromat.*
Epsom Salt	*Magnesii Sulphas*

Flowers of Sulphur	*Sulphur Sublimatum*
Flowers of Zinc	*Zinci Oxidum*
Fluid Magnesia	*Liq. Magnesii Carb.*
Fowler's Solution	*Liq. Arsenicalis*
Friar's Balsam	*Tinct. Benzoin Co.*
Glauber's Salt	*Sodii Sulphas*
Glonoin Solution	*Liquor Trinitrini*
Goulard's Extract	*Liquor Plumbi Fortis*
Goulard's Water	*Liquor Plumbi Dil.*
Green Vitriol	*Ferri Sulphas*
Gregory's Powder	*Pulv. Rhei Co.*
Griffith's Mixture	*Mist. Ferri Co.*
Hoffmann's Anodyne	*Sp. Æther. Co.*
Huile de Cade	*Juniper Tar Oil*
Huxham's Tincture	*Tinct. Cinchonæ Co.*
Ichthyocolla	*Isinglass*
Laudanum	*Tinct. Opii*
Lavender Drops	*Tinct. Lavand. Co.*
Lenitive Electuary	*Conf. Sennæ*
Liquor Donovani	*Liq. Arsenii et Hydrarg. Iodidi*
Liquor Potassæ Arsenitis	*Liq. Arsenicalis*
Liver of Sulphur	*Potassa Sulphurata*
Lugol's Solution	*Liquor Iodi B.P.* 1885
Lunar Caustic	*Argenti Nitras*
Medulla Bovis	*Beef Marrow*
Mica Panis	*Breadcrumb*
Milk of Sulphur	*Sulphur Præcipitat.*
Mindererus Spirit	*Liq. Ammon. Acetatis*
Mistura Acaciæ	*Mucilago Acaciæ*
Nitre	*Potassii Nitras*
Oil of Vitriol	*Acid. Sulphuric.*
Oleum Bubulum	*Neatsfoot Oil*
Olum Nervinum	*Neatsfoot Oil*
Oleum Rusci	*Oil of Birch Tar*
Opodeldoc	*Lin. Saponis*
Paregoric	*Tinct. Camph. Co.*
Pill, Blaud's	*Pil. Ferri*
Pill, Blue	*Pil. Hydrargyri*
Pill, Plummer's	*Pil. Hydrarg. Subchlor. Co.*
Precipitate, Red	*Hydrarg. Oxid. Rub.*
Precipitate, White	*Hydrarg. Ammoniatum*

Rochelle Salt	*Soda Tartarata*
Sal Alembroth	*Chloride of Ammonium and Mercury*
Sal Ammoniac	*Ammon. Chloridum*
Sal Prunella	*Potassii Nitras*
Sal Volatile	*Ammonii Carbonas*
Salt of Tartar	*Potassii Carbonas*
Saltpetre	*Potassii Nitras*
Scott's Dressing	*Ung. Hydrarg. Co.*
Solution, Donovan's	*Liq. Arsenii et Hydrargyri Iodidi*
Solution, Fowler's	*Liquor Arsenicalis*
Spirit of Hartshorn	*Liquor Ammoniæ*
Spirit of Salt	*Acid. Hydrochloric.*
Spirit. Frumenti	*Whisky*
Spirit. Lavand. Co.	*Tinct. Lavand. Co.*
Spirit. Sacchari	*Rum*
Steel Drops	*Tr. Ferri Perchlor.*
Sugar of Lead	*Plumbi Acetas*
Tartar Emetic	*Antim. Tartaratum*
Tinct. Meconii	*Tinct. Opii*
Tinct. Thebaici	*Tinct. Opii*
Trooper's Ointment	*Ung. Hydrarg. Mite*
Ward's Paste	*Conf. Piper. Nig.*

TABLE OF SOLUBILITIES

Showing *approximately* the number of *grains* soluble in *one fluid ounce* of water at normal temperature.

Acetanilidum	Antifebrin	2
Acidum, Acetylsalicylicum	Aspirin	1
,, Arseniosum	Arsenious Anhydride	4
,, Boricum	Boracic Acid	17
,, Carbolicum	Phenol	35
,, Citricum		Freely soluble
,, Picricum		5
,, Salicylicum		Less than 1 gr.
,, Tannicum		Freely soluble
Aloinum		3
Alumen		40
Ammonii Bromidum		Freely soluble
,, Carbonas		100
,, Chloridum		140

Antimonii Oxidum		Insoluble
Antimonium Tartaratum	Tartar Emetic	26
Argenti Nitras		Freely soluble
Arsenii Iodidum		40
Bismuthi et Ammonii Citras		Freely soluble
,, Carbonas		Insoluble
,, Salicylas		,,
,, Subnitras		,,
Borax		17
Butyl Chloral Hydras		10
Caffeina		6
Caffeinæ Citras		13
Calcii Carbonas Precip.	Creta Precip.	Insoluble
,, Chloridum		Freely soluble
,, Glycerophosphas		20
,, Hydras		Slightly soluble
,, Hypophosphis		50
,, Lactas		20
Camphora		½
Cerii Oxalas		Insoluble
Chloral Hydras		Freely soluble
Chloroformum		2 minims
Cocaina		Insoluble
Cocainæ Hydrochloridum		Freely soluble
Codeina		5
Codeinæ Phosphas		100
Cupri Sulphas		120
Ferri et Ammonii Citras		Freely soluble
,, Quininæ Citras		,,
,, Sulphas		,,
Glusidum	Saccharin	1
Hydrargyri Perchloridum		20
,, Subchloridum		Insoluble
Iodoformum		,,
Iodum		,,
Lithii Carbonas		6
,, Citras		200
Magnesii Carbonas (Levis, Ponderosus)		Insoluble
,, Sulphas		Freely soluble
Morphina		Less than ½
Morphinæ Acetas		160
,, Hydrochloridum		18
,, Sulphas		20
,, Tartras		40

Pepsinum	Slightly
Phenacetinum	Insoluble
Phenazonum	Freely soluble
Plumbi Acetas	200
Potassii Bicarbonas	120
,, Bromidum	240
,, Chloras	26
,, Citras	Freely soluble
,, Iodidum	,,
,, Nitras	100
,, Permanganas	20
,, Sulphas	40
,, Tartras Acidus	2
Quinina	Insoluble
Quininæ Hydrochloridum	10
,, Salicylas	½
,, Sulphas	½
Saccharum	Freely soluble
,, Lactis	70
Salicinum	15
Salol	Insoluble
Sodii Arsenas (Anhydrosus)	100
,, Bicarbonas	35
,, Bromidum	Freely soluble
,, Carbonas	,,
,, Chloridum	150
,, Citras	Freely soluble
,, et Potassii Tartras	Freely soluble
,, Glycerophosphas	,,
,, Hydroxidum	,,
,, Hypophosphis	,,
,, Phosphas	70
,, Salicylas	,,
,, Sulphas	140
,, Sulphis	Freely soluble
,, Sulphocarbolas	70
Strychnina	Insoluble
Strychninæ Hydrochloridum	10
Sulphonal	½
Sulphur	Insoluble
Thymol	,,
Zinci Sulphas	Freely soluble
,, Sulphocarbolas	,,

TABLE OF THE MORE POTENT CHEMICAL SUBSTANCES, WITH THEIR PREPARATIONS, STRENGTHS, AND DOSES[1]

Pharmacopœial Name.	Dose.		Preparations.	Strength.	Dose.	
	Imperial Denomination.	Metric Denomination.			Imperial Denomination.	Metric Denomination.
Acetanilidum .	2– 5 gr.	0·12 –0·3 gm.				
Acid. Arseniosum	$\frac{1}{64}$–$\frac{1}{16}$,,	0·001 –0·004 ,,	Liquor Arsenicalis . .	1 pt. in 100 fl. pts.	2–8 ♏	0·12 – 0·5 c.c.
			,, Arsenici Hydrochloricus	1 ,, in 100 ,,	2–8 ♏	0·12 – 0·5 ,,
,, Carbolicum	1– 3 ,,	0·06 –0·2 ,,	Acid. Carbolicum Liquidum	100 pts. in 115 pts.	1–3 ♏	0·06 – 0·18 ,,
			Glycerinum Acidi Carbolici	20 ,, in 100 ,,		
			Suppositoria ,, ,,	1 gr. in each		
			Unguentum ,, ,,	3 pts. in 100 pts.		
,, Hydrocyanic Dil.	2– 5 ♏	0·12 –0·3 c.c.	Tr. Chloroformi et Morphinæ	5 ,, in 100 fl. pts. of the diluted acid	5–15 ♏	0·3 – 1·0 ,,
Amyl Nitris . .	2– 5 ♏	0·12 –0·3 ,,	(by inhalation) . . .			
Antimonii Oxidum	1– 2 gr.	0·06 –0·12 gm.	Pulvis Antimonalis . .	$33\frac{1}{3}$ pts. in 100 pts.	3–6 gr.	0·2 – 0·4 gm.
,, Tartaratum	$\frac{1}{35}$–$\frac{1}{8}$,,	0·0025–0·008 ,,	Vinum Antimoniale . .	0·4 ,, in 100 fl. pts.	10–30 ♏	0·6 – 1·8 c.c.
,, ,,	$\frac{1}{2}$– 1 ,, as an emetic	0·03 –0·06 ,,	,, ,, . .	—	2–4 fl. dr. as an emetic	8·0 –16·0 ,,
Apomorphinæ Hydrochl.	$\frac{1}{10}$–$\frac{1}{4}$ gr.	0·006 –0·016 ,,	Injectio Apomorphinæ Hypodermica	1 pt. in 100 fl. pts.	5–10 ♏ by injection	0·3 – 0·6 ,,
Argenti Nitras .	$\frac{1}{4}$–$\frac{1}{2}$,,	0·016 –0·03 ,,	Argenti Nitras Induratus	95 pts. in 100 pts.		
			,, ,, Mitigatus	$33\frac{1}{3}$,, in 100 ,,		
Arsenii Iodidum .	$\frac{1}{20}$–$\frac{1}{5}$,,	0·003 –0·012 ,,	Liq. Arsenii et Hydrargyri Iodidi	1 pt. in 100 fl. pts.	5–20 ♏	0·3 – 1·2 ,,
Atropina . .	$\frac{1}{200}$–$\frac{1}{100}$ gr.	0·0003–0·0006 ,,	Unguentum Atropinæ .	2 pts. in 100 pts.		
Atropinæ Sulphas	$\frac{1}{200}$–$\frac{1}{100}$,,	0·0003–0·0006 ,,	Lamellæ Atropinæ . .	$\frac{1}{5000}$ gr. in each		
			Liquor Atropinæ Sulphatis	1 pt. in 100 fl. pts.	$\frac{1}{2}$–1 ♏	0·03 – 0·06 ,,
Butyl Chloral Hydras	5– 20 ,,	0·3 –1·2 ,,				

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[1] 1 grain equals approximately 64 milligrammes (0·064 gramme), or 1 milligramme equals $\frac{1}{64}$ grain.

CHEMICAL SUBSTANCES: PREPARATIONS, STRENGTHS, AND DOSES—*Continued*

Pharmacopœial Name.	Dose.		Preparations.	Strength.	Dose.	
	Imperial Denomination.	Metric Denomination.			Imperial Denomination.	Metric Denomination.
Chloral Hydras	5– 20 gr.	0·3 –1·2 gm.	Syrupus Chloral	20 pts. in 100 fl. pts.	½–2 fl. dr.	2·0 – 8·0 c.c.
Chloroformum	1– 5 ♏	0·06 –0·3 c.c.	Aqua Chloroformi	0·25 vol. in 100 vols.	½–1 fl. oz.	
			Linimentum Chloroformi	50 vols. in 100 ,,		
			Spiritus ,,	5 ,, in 100 ,,	5–20 ♏	0·3 – 1·2 ,,
			Tinct. Chlorof. et Morphinæ Composita	7·5 ,, in 100 ,,	5–15 ♏	0·3 – 1·0 ,,
Cocainæ Hydrochloridum	1/10– ¼ gr.	0·006 –0·016 gm.	Injectio Cocainæ Hypodermica	5 pts. in 100 fl. pts.	5–10 ♏ by injection	0·3 – 0·6 ,,
			Lamellæ Cocainæ	1/50 gr. in each		
Codeina	¼– 1 gr.	0·016 –0·06 ,,				
Codeinæ Phosphas	¼– 1 ,,	0·016 –0·06 ,,	Syrupus Codeinæ Phosphatis	¼ gr. in 1 fl. dr.	½–2 fl. dr.	2·0 – 8·0 ,,
Creosotum	1– 5 ♏	0·06 –0·3 c.c.	Unguentum Creosoti	10 pts. in 100 pts.		
Cupri Sulphas	¼– 2 gr.	0·016 –0·12 gm.	(5–10 gr. is given as an emetic)			
Elaterium	1/10– ½ ,,	0·006 –0·03 ,,	Elaterinum	—	1/40–1/10 gr.	0·0015–0·006 gm.
Ferri Arsenas	1/16– ¼ ,,	0·004 –0·015 ,,				
Homatropinæ Hydrobrom.	1/64– 1/32 ,,	0·001 –0·002 ,,	Lamellæ Homatropinæ	1/100 gr. in each		
Hydrargyri Iodid. Rubrum	1/32– 1/16 ,,	0·002 –0·004 ,,	Liq. Arsenii et Hydrargyri Iodidi	1 pt. in 100 fl. pts.	5–20 ♏	0·3 – 1·2 c.c.
			Ung. Hydrargyri Iodidi	4 pts. in 100 pts.		
Hydrargyri Perchloridum	1/32– 1/16 ,,	0·002 –0·004 ,,	Liq. Hydrargyri Perchloridi	1 pt. in 1000 fl. pts.	½–1 fl. dr.	2·0 – 4·0 ,,
			Lotio Hydrargyri Flava	0·46 pt. in 100 fl. pts.		
Hydrargyri Subchloridum	½– 5 ,,	0·03 –0·3 ,,	Lotio Hydrargyri Nigra	About 1 pt. in 150 fl. pts.		
			Pilula Hydrargyri Subchlor. Comp.	About 25 pts. in 100 pts.	4–8 gr.	0·25 – 0·5 gm.
			Unguentum Hydrargyri Subchloridi	20 pts. in 100 pts.		

Hyoscinæ Hydrobromidum	$\frac{1}{200}$–$\frac{1}{100}$ gr.	0·0003–0·0006 gm.				
Hyoscyaminæ Sulphas	$\frac{1}{200}$–$\frac{1}{100}$,,	0·0003–0·0006 ,,				
Iodoformum . .	$\frac{1}{2}$– 3 ,,	0·03 –0·2 ,,	Suppositoria . . .	3 grs. in each		
			Unguentum Iodoformi .	10 pts. in 100 pts.		
Iodum . . .	—	—	Tinctura Iodi Mitis . .	2·5 pts. in 100 fl. pts.	2–5 ♏	0·12 – 0·3 c.c.
			Tinctura Iodi Fortis . .	10 pts. in 100 fl. pts.		
			Unguentum Iodi . .	4 pts. in 100 pts.		
Morphinæ Acetas .	$\frac{1}{8}$– $\frac{1}{2}$,,	0·008 –0·03 ,,	Liquor Morphinæ Acetatis	1 pt. in 100 fl. pts.	10–60 ♏	0·6 – 3·6 ,,
,, Hydrochloridum	$\frac{1}{8}$– $\frac{1}{2}$,,	0·008 –0·03 ,,	,, ,, Hydrochloridi	1 ,, in 100 ,,	10–60 ♏	0·6 – 3·6 ,,
			Suppositoria Morphinæ .	$\frac{1}{4}$ gr. in each		
			Tinct. Chlorof. et Morphinæ Composita	About 1 pt. in 100 fl. pts.	5–15 ♏	0·3 – 1·0 ,,
			Troch. Morphinæ . .	$\frac{1}{32}$ gr. in each		
			,, ,, et Ipecacuanhæ	$\frac{1}{32}$ gr. in each		
Morphinæ Tartras	$\frac{1}{8}$– $\frac{1}{2}$,,	0·008 –0·03 ,,	Injectio Morphinæ Hypodermica	2·5 pts. in 100 fl. pts.	5–10 ♏ by subcut.	0·3 – 0·6 ,,
			Liquor Morphinæ Tartratis	1 pt. in 100 fl. pts.	10–60 ♏	0·6 – 3·6 ,,
Phosphorus . .	$\frac{1}{100}$– $\frac{1}{25}$,,	0·0006–0·0025 ,,	Pilula Phosphori . .	1 pt. in 100 pts.	1–4 gr.	0·06 – 0·25 gm.
			Oleum Phosphoratum .	1 ,, in 100 ,,	1–5 ♏	0·06 – 0 3 c.c.
Physostigminæ Sulphas	$\frac{1}{64}$ – $\frac{1}{32}$,,	0·001 –0 002 ,,	Lamellæ Physostigminæ .	$\frac{1}{1000}$ gr. in each		
Pilocarpinæ Nitras	$\frac{1}{20}$– $\frac{1}{5}$,,	0·003 –0·012 ,,				
Plumbi Acetas .	1– 5 ,,	0·06 –0·3 ,,	Pilula Plumbi c. Opio .	3 grs. in 4		
			Suppositoria Plumbi c. Opio	3 grs. in each		
Sodii Arsenas Anhydrosus	$\frac{1}{40}$– $\frac{1}{10}$,,	0·001 - 0·006 ,,	Liquor Sodii Arsenatis .	1 pt. in 100 fl. pts.	2–8 ♏	0·12 – 0·5 c.c.
Strychnina . .	$\frac{1}{64}$– $\frac{1}{16}$,,	0·001 –0·004 ,,	Syrupus Eastonii . .			
Strychninæ Hydrochloridum	$\frac{1}{64}$– $\frac{1}{16}$,,	0·001 –0·004 ,,	Injectio Strychninæ Hypodermica	1 ,, in 133 ,,	5–10 ♏	0·3 – 0·6 ,,
			Liquor Strychninæ Hydrochloridi	1 ,, in 100 ,,	2–8 ♏	0·12 – 0·5 ,,
Zinci Acetas . .	1– 2 ,,	0·06 –0·12 ,,				
,, Sulphas .	1 3 ,,	0 06 –0·2 ,,				
	10– 30 ,,	0·6 –2·0 ,,	(as an emetic)			

TABLE OF THE MORE POTENT VEGETABLE SUBSTANCES, WITH THEIR PREPARATIONS, STRENGTHS, AND DOSES[1]

Name.	Preparations.	Strength.	Dose.	
			Imperial Denomination.	Metric Denomination.
Aconiti Radix	Tinctura Aconiti	0·04 pt. ether soluble alkaloids in 100 fl. pts.	2-5 ♏	0·12 – 0·3 c.c.
	Linimentum Aconiti	0·2 pt ether soluble alkaloids in 100 fl. pts.		
Belladonnæ Folia	Extractum Belladonnæ Siccum	1·00 pt. total alkaloid in 100 fl. pts.	¼– 1 gr.	0·016– 0·06 Gm.
	Tinctura Belladonnæ	0·035 ,, ,, 100 ,,	5-15 ♏	0·3 – 1·0 c.c.
,, Radix	Extractum Belladonnæ Liquidum	0·75 ,, ,, 100 ,,		
	Linimentum ,,	0·375 ,, ,, 100 ,,		
	Emplastrum ,,	0·025 ,, ,, 100 pts.		
	Unguentum ,,	0·6 ,, ,, 100 ,,		
Cannabis Indica	Extractum Cannabis Indicæ	. . . .	¼– 1 gr.	0·016– 0·06 gm.
	Tinctura ,, ,,	5 pts. of the extract in 100 fl. pts.	5-15 ♏	0·3 – 1·0 c.c.
Colchici Cormus	Extractum Colchici	. . . .	¼– 1 gr.	0·016– 0·06 gm.
	Vinum ,,	20 pts. in 100 fl. pts.	10-30 ♏	0·6 – 1·8 c.c.
,, Semina	Tinctura ,,	10 ,, in 100 ,,	5-15 ♏	0·3 – 1·0 ,,
Digitalis Folia	Infusum Digitalis	3 grs. in 1 fl. ounce	2– 4 fl. drachms	7·0 –15·0 ,,
	Tinctura ,,	10 pts. in 100 fl. pts.	5-15 ♏	0·3 – 1·0 ,,
Ergota	Extractum Ergotæ	. . . .	2– 8 grs.	0·12 – 0·5 gm.
	,, ,, Liquidum	1 pt. in 1 fl. pt.	10-30 ♏	0·6 – 1·8 c.c.
	Infusum ,,	5 pts. in 100 fl. pts.	1– 2 fl. ounces	30·0 –60·0 ,,
	Injectio Ergotæ Hypodermica	33 pts. extract in 100 fl. pts.	5-10 ♏	0·3 – 0·6 ,,
	Tinctura Ergotæ Ammoniata	25 pts. in 100 fl. pts.	½– 1 fl. drachm	2·0 – 4·0 ,,

Gelsemii Radix	Tinctura Gelsemii	10 pts. in 100 fl. pts.	5-15 ♏	0·3 - 1·0 c.c.
Ipecacuanhæ Radix	Extractum Ipecacuanhæ Liquidum	2 pts. total alkaloids in 100 fl. pts	⅓- 2 ♏	0·03 - 0·12 ,,
Lobelia	Tinctura Lobeliæ Ætherea	20 pts. in 100 fl. pts.	5-15 ♏	0·3 - 1·0 ,,
Nucis Vomicæ Semina	Extractum Nucis Vomicæ Siccum	5 pts. of strychnia in 100 pts.	¼- 1 gr.	0·016- 0·06 gm.
	,, ,, Liquidum	1·5 pts. ,, 100 fl. pts.	1- 3 ♏	0·06 - 0·18 c.c.
	Tinctura Nucis Vomicæ.	0·125 ,, ,, 100 ,,	5-15 ♏	0·3 - 1·0 ,,
Opium, in powder		Contains when dry 10 per cent. of anhydrous morphia	½- 2 grs.	0·03 - 0·12 gm.
	Extractum Opii Siccum	Contains 20 pts. of morphia in 100 pts.	¼- 1 gr.	0·016- 0·06 ,,
	,, ,, Liquidum	,, 0·75 pt. ,, 100 fl. pts.	5-30 ♏	0·3 - 1·8 c.c.
	Linimentum ,,	,, 0·375 ,, ,, 100 ,,		
	Tinctura ,,	,, 1·0 ,, ,, 100 ,,	5-15 ♏	0·3 - 1·0 ,,
	,, ,, Ammoniata	,, 0·10 ,, ,, 100 ,,	½- 1 fl. drachm	2·0 - 4·0 ,,
	,, Camphoræ Composita	,, 0·05 ,, ,, 100 ,,	½- 1 ,,	2·0 - 4·0 ,,
	Pilula Ipecacuanhæ cum Scillâ	,, 0·50 ,, ,, 100 pts.	4- 8 gr.	0·25 - 0·5 gm.
	,, Plumbi cum Opio	,, 1·25 pts. ,, 100 ,,	2- 4 ,,	0·12 - 0·25 ,,
	,, Saponis Composita	,, 2·0 ,, ,, 100 ,,	2- 4 ,,	0·12 - 0·25 ,,
	Pulvis Cretæ Aromaticus cum Opio	,, 0·25 pt. ,, 100 ,,	10-60 ,,	0·6 - 4·0 ,,
	,, Ipecacuanhæ Compositus	,, 1·00 ,, ,, 100 ,,	5-15 ,,	0·3 - 1·0 ,,
	,, Kino Compositus	,, 0·50 ,, ,, 100 ,,	5-20 ,,	0·3 - 1·2 ,,
	,, Opii ,,	,, 1·0 ,, ,, 100 ,,	5-15 ,,	0·3 - 1·0 ,,
	Unguentum Gallæ cum Opio	,, 0·75 ,, ,, 100 ,,		
	Suppositoria Plumbi Composita	1 gr. of opium in each		
Podophylli Rhizoma	Podophylli Resina		¼- 1 gr.	0·016- 0·06 ,,
	Tinctura Podophylli	2 grs. resin in 1 fl. drachm	5-15 ♏	0·3 - 1·0 c.c.
Stramonii Folia	,, Stramonii	20 pts. in 100 fl. pts.	5-15 ♏	0·3 - 1·0 ,,
Strophanthus Semina	Extractum Strophanthi	50 pts. seed in 100 pts.	¼- 1 gr.	0·016- 0·06 gm.
	Tinctura ,,	10 pts. in 100 fl. pts.	2- 5 ♏	0·12 - 0·3 c.c.

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[1] 1 grain equals approximately 64 milligrammes (0·064 gramme), or 1 milligramme equals $\frac{1}{64}$ grain.

POISONS

The dispensing and selling of poisons is one of the most important functions of the legally qualified pharmacist. By the Pharmacy Act of 1868 it is unlawful for any person, not being a pharmaceutical chemist or chemist and druggist within the meaning of the Act, to sell or keep open shop for the retailing, dispensing, or compounding of poisons described in the schedule. As the law has placed pharmacists in such a responsible position, it behoves them to see not only that all the provisions of the Act are duly observed, but that in all dealings of which poisons form a part the greatest care is exercised.

PRECAUTIONS REQUIRED BY THE PHARMACY ACT, 1868, TO BE OBSERVED IN SELLING BY RETAIL AND IN DISPENSING POISONS

All the articles named or referred to in the list, both in Part I and Part II, are *poisons* within the meaning of the Pharmacy Act, 1868.

Sale by Retail

I. *Relating to Part I and Part II of the list.*—It is unlawful to sell any 'poison' by retail unless the vessel, wrapper, or cover in which it is contained be distinctly labelled with *the name of the article,* the word *Poison,* and *the name and address of the seller.* This applies to all the articles in both parts of the list.

II. *Relating to Part I only.*—It is unlawful to sell by retail any poison included in Part I of the list to any person unknown to the seller, unless introduced by some person known to both parties; and on every sale of any such article the seller shall, before delivery, make or cause to be made an entry in a book, to be kept for that purpose, of—

(1) The date of sale;

(2) The name and address of the purchaser;

(3) The name and quantity of the article sold; and

(4) The purpose for which it is stated to be required; to which the signature of the purchaser, and of the person, if any, who introduced him, shall be affixed. *The article must also be labelled with the name of the article, the word 'Poison,' and the name and address of the seller.*

III. *Relating only to arsenic and its preparations.*—It is unlawful to sell arsenic or any of its preparations unless, in addition to all the foregoing regulations, the following provisions of the Arsenic Act be also observed:

(1) That the poison, if colourless, be mixed with at least one-sixteenth its weight of soot or half as much indigo, unless sold in a quantity of not less than ten pounds and for a purpose (*not* for use in agriculture) for which such admixture would render it unfit.

(2) That the person to whom the poison is sold or delivered be of mature age;

(3) That the occupation as well as the name and address of the purchaser be entered in the poison book.

Dispensing

None of the foregoing regulations applies to any article when forming part of the ingredients of any medicine dispensed by a registered chemist and druggist; but it is necessary, if a medicine contain a poison included in Part I or Part II of the list, that the ingredients of the medicine, together with the name of the person to whom it is sold or delivered, be entered in a book kept for that purpose (*Prescription-book*), and the name and address of the seller be attached to the medicine.

Re-copying of prescriptions containing scheduled poisons.—It is not considered to be absolutely necessary to re-copy such prescriptions each time they are dispensed, *but it is necessary* to enter the number of the prescription, name, date, and address of the patient each time, in order to comply with the foregoing, and for this purpose a special register should be kept.

List of Poisons within the meaning of the Act

PART I

Not to be sold unless *the purchaser is known to the seller, or is introduced by some person known to both parties ;*

also entry to be made in Poison Book of—

(1) *Date of sale ;*
(2) *Name and address of purchaser ;*
(3) *Name and quantity of article ;*
(4) *Purpose for which it is wanted ; attested by signature ;*

and must be labelled with—

(1) *Name of article ;*
(2) *The word 'POISON' ;*
(3) *Name and address of seller*

ARSENIC, and its medicinal preparations (see Note below)

ACONITE, ACONITINE, and their preparations

ALKALOIDS—all poisonous vegetable alkaloids not specifically named in this Schedule, and their salts, and all poisonous derivatives of vegetable alkaloids

ATROPINE, and its salts, and their preparations

BELLADONNA, and all preparations or admixtures (except belladonna plasters) containing 0·1 or more per cent. of belladonna alkaloids

CANTHARIDES, and its poisonous derivatives

COCA, any preparation or admixture of, containing 1 or more per cent. of coca alkaloids

CORROSIVE SUBLIMATE

Not to be sold unless *the purchaser is known to the seller, or is introduced by some person known to both parties ;* also entry to be made in Poison Book of (1) *Date of sale ;* (2) *Name and address of purchaser ;* (3) *Name and quantity of article ;* (4) *Purpose for which it is wanted ; attested by signature ;* and must be labelled with— (1) *Name of article ;* (2) *The word 'POISON' ;* (3) *Name and address of seller*	Cyanide of Potassium, and all poisonous cyanides and their preparations Diethyl-Barbituric Acid, and other alkyl, aryl, or metallic derivatives of barbituric acid, whether described as Veronal, Proponal, Medinal, or by any other trade name, mark, or designation ; and all poisonous Urethanes and Ureides Emetic Tartar, and all preparations or admixtures containing 1 or more per cent. of emetic tartar Ergot of Rye, and preparations of ergot Lead in combination with Oleic Acid, or other higher fatty acids, whether sold as diachylon or under any other designation (except machine-spread plasters) Nux Vomica, and all preparations or admixtures containing 0·2 or more per cent. of strychnine Opium, and all preparations or admixtures containing 0·75 or more per cent. of morphine Picrotoxin Prussic Acid, and all preparations or admixtures containing 0·1 or more per cent. of prussic acid Savin, and its oil, and all preparations or admixtures containing savin or its oil

PART II

Must be labelled with— (1) *Name of article ;* (2) *The word 'POISON' ;* (3) *Name and address of seller*	Almond, Essential Oil of (unless deprived of prussic acid) Antimonial Wine Cantharides, tincture and all vesicating liquid preparations or admixtures of

CARBOLIC ACID, and liquid preparations of carbolic acid and its homologues, containing more than 3 per cent. of those substances, except preparations for use as sheep wash or for any other purpose in connection with agriculture or horticulture, contained in a closed vessel distinctly labelled with the word 'Poisonous,' the name and address of the seller, and a notice of the special purposes for which the preparations are intended

CHLORAL HYDRATE

CHLOROFORM, and all preparations or admixtures containing more than 20 per cent. of chloroform

COCA, any preparation or admixture of, containing more than 0·1 per cent., but less than 1 per cent., of coca alkaloids

DIGITALIS

MERCURIC IODIDE

MERCURIC SULPHOCYANIDE

OXALIC ACID

POPPIES, all preparations of, excepting red poppy petals and syrup of red poppies (*Papaver rhœas*)

PRECIPITATE, RED, and all oxides of mercury

PRECIPITATE, WHITE

STROPHANTHUS

SULPHONAL and its homologues, whether described as Trional, Tetronal, or by any other trade name, mark, or designation

ALL PREPARATIONS OR ADMIXTURES which are not included in Part I of this Schedule, and contain a poison within the meaning of the Pharmacy Acts (See Note below), except preparations or admixtures the exclusion of which from this Schedule is indicated by the words therein relating to carbolic acid, chloroform, and coca, and except such substances as come within the provisions of Section 5 of this Act

Must be labelled with—

(1) *Name of article ;*
(2) *The word 'POISON' ;*
(3) *Name and address of seller*

Note.—Special importance attaches to the last paragraph of Part II, as the effect of that paragraph is to include in Part II many preparations and admixtures which are not specifically named in the Schedule, including preparations and admixtures of non-scheduled vegetable drugs—such as Calabar bean, colchicum, conium, gelsemium, hyoscyamus, lobelia, stavesacre, stramonium, etc.—which contain poisonous alkaloids.

The following articles may be sold by retailers other than pharmacists, but in all cases the sale is unlawful unless the conditions stated below are complied with :

Only to be sold in bottles or other containers, rendered distinguishable *by touch* from ordinary bottles or containers. Must be labelled with— (1) *Name of article ;* (2) *The words—* *'POISONOUS—NOT TO BE TAKEN' ;* (3) *Name and address of seller*	Ammonia, liquid preparations of, containing more than 5 per cent. by weight of free ammonia Carbolic Acid (Carbolic, Carbolic substitutes, Carbolic Disinfectants), containing not more than 3 per cent. of Phenols Hydrochloric Acid Nitric Acid Oxalic Acid, soluble salts of Sulphuric Acid

Special Precautions

With a view to the prevention of accidents, the Pharmaceutical Society strongly recommends all Pharmacists to adopt special precautions when dealing with the following articles: Acetanilide, Amyl Nitrite, Antipyrine (Phenazone), Butyl-Chloral Hydrate, Cannabis Indica and its Preparations, Elaterium, Phenacetin, and Vermin Killers containing free Phosphorus. The sale of such articles as Adrenalin, Lead Salts, Phosphorus and Preparations containing Phosphorus in the free state, Poisonous Glucosides and Preparations containing such, Potassium Bichromate, Synthetic Cocaine-Substitutes, Zinc Salts, etc., also demands special precautions.

Regulations for the Keeping, Dispensing, and Selling of Poisons

The following, having been prescribed by the Pharmaceutical Society of Great Britain with the consent of the Privy Council, form part of the Pharmacy Act, 1868, by virtue of the Provisions of Section 1 of that Act:

1. That in the keeping of poisons each bottle, vessel, box, or package containing a poison be labelled with the name of the article, and also with some distinctive mark indicating that it contains poison.

2. Also that in the keeping of poisons each poison be kept on one or other of the following systems, viz.:

(*a*) In a bottle or vessel tied over, capped, locked, or otherwise secured in a manner different from that in which bottles or vessels containing ordinary articles are secured in the same warehouse, shop, or dispensary; or

(*b*) In a bottle or vessel rendered distinguishable by touch from the bottles or vessels in which ordinary articles are kept in the same warehouse, shop, or dispensary; or

(*c*) In a bottle, vessel, box, or package kept in a room or cupboard set apart for dangerous articles.

3. That in the dispensing and selling of poisons all liniments, embrocations, lotions, and liquid disinfectants containing poison be sent out in bottles rendered distinguishable by touch from ordinary medicine-bottles, and that there also be affixed to each such bottle (in addition to the name of the article, and to any particular instructions for its use) a label giving notice that the contents of the bottle are not to be taken internally.

Experience has taught that the greatest safety is obtained by keeping all poisons and potent remedies in a cupboard by themselves. As an extra safeguard this cupboard may be kept locked, and a bell so arranged that an alarm is given each time of opening. Where two or more dispensers are kept, no poisons should ever be dispensed or sold without the presence of a qualified witness, whose duty it should be to make a note in a book kept for the purpose of the name and amount of medicament, the number of the prescription, with both his own and the dispenser's initials. It is impossible to bestow too much care on the keeping and dispensing of poisons, and in every case of doubt the dispenser should, no matter at what cost of time and trouble, assure himself that he is carrying out the *intention* of the prescriber.

A copy of the Poison Schedule should be hung in the immediate vicinity of the poison cupboard, as well as a table of antidotes for the more commonly occurring poisons, so as to be provided for all cases of emergency.

In retailing poisonous substances it is always better to err on the side of caution. Although all the poisons in the schedule *may* be sold if the legal requirements are fulfilled, yet it is the duty of a pharmacist to supply them *only when he can reasonably assure himself that they are to be used for legitimate purposes.*

POISONS AND THEIR ANTIDOTES

In case of poisoning, *first send for a medical man*; then administer an emetic, unless corrosive acids or strong alkalies are known to have been swallowed. The safest emetics are:

1. One tablespoonful of common salt in a tumbler of warm water.

2. One tablespoonful of mustard in a tumbler of warm water.

3. One to two tablespoonfuls of ipecacuanha wine.

4. Thirty grains of zinc sulphate in half a tumbler of warm water.

5. One-tenth grain of apomorphine hydrochloride injected hypodermically.

Stomach syphon.—This consists of soft rubber tubing about half an inch in diameter and six feet in length. One end is oiled and passed down the gullet into the stomach; the other end being raised above the patient's head, the tube is *filled* with water by means of a funnel, pinched tightly to prevent the water escaping, and lowered, when, on relaxing the pressure, syphoning commences. After evacuation of the stomach, the operation should be repeated if necessary.

A stomach syphon must not be used in cases of poisoning with corrosive acids or alkalies, on account of the danger to the injured membrane.

Acid, Carbolic; Carbolic Disinfectants	Wash out stomach with soft rubber syphon. Give large doses of olive or any bland oil. The whites of several eggs beaten up in a little water. Afterwards brandy and spirit of sal volatile.
Acid, Oxalic; Oxalates	Stomach syphon dangerous unless used very carefully and without appreciable loss of time. Give calcium chloride or chalk, whiting, or magnesia as for mineral acids. Soda or potash useless, owing to formation of soluble salt.
Acid, Prussic, and Cyanides	A mixture of ferric chloride, ammonia, and water; brandy. Artificial respiration. Oxygen.
Acids, Corrosive Mineral	Chalk, whiting, or magnesia in water—or wall plaster or whiting from ceiling. Sodium bicarbonate or washing-soda less useful on account of the gas evolved. Afterwards milk,

	olive or any bland oil; boiled oatmeal or linseed gruel. *Do not use Stomach Pump or Syphon.*
Aconite	Emetic; animal charcoal in water; stimulants—brandy, ether, ammonia. Hot-water bottles to feet and chest.
Alkalies: Ammonia, Potash, Soda	Vinegar; citric or tartaric acid; lemon-juice. Milk, olive oil, white of egg, linseed tea or oatmeal gruel. Brandy. *Do not use Stomach Pump or Syphon.*
Antimony Salts	Emesis generally produced. Give copious draughts of warm water; tannic acid, strong tea (*boil the leaves to extract the tannin*); white of egg. Brandy, spirit of sal volatile.
Arsenic Compounds; Weed-killers, Sheep-dips	If strongly caustic weed-killer has been taken, treat first for the alkali (*q.v.*). If simple arsenical poisoning, use stomach syphon or give emetic; ferric hydrate (calcined magnesia added to ferric chloride); dialysed iron, milk, white of egg, magnesia. Oatmeal gruel, linseed tea.
Atropine	See Belladonna.
Barium Salts	Epsom or Glauber's salt in water; emetic.
Belladonna	Stomach syphon or emetic; 20 gr. tannic acid, strong tea made by *boiling* the leaves; charcoal and water; hypodermic injection of $\frac{1}{4}$ gr. pilocarpine nitrate. Artificial respiration. Oxygen.
Cantharides	Emetic at *once.* Empty stomach by means of soft tube. Proceed very carefully if there is blistering. Opium, morphine subcutaneously. Linseed tea, oatmeal gruel.
Chloroform; Chloral	Stomach tube, emetic, fresh air, artificial respiration, oxygen. Amyl-nitrite inhalation; 10 min. of solution of strychnine hydrochloride 1 per cent.
Colchicum; Conium	Emetic, egg albumen, tannic acid, strong tea.
Copper Salts: Verdigris, Blue Vitriol	If vomiting has not occurred, use stomach syphon. Give 10 gr. potassium ferrocyanide in a little water. Give chalk or magnesia, milk, and white of egg. Poultice abdomen.

Digitalis	Stomach syphon or emetic; 20 gr. tannic acid or very strong tea made by *boiling* the leaves; animal charcoal in water.
Eserine	Stomach tube or emetic; tannic acid.
Fungi	Stomach tube or emetic; treat on general principles.
Henbane	As for Belladonna.
Gases: Coal Gas, Sewer Gas, Nitrous Fumes, &c.	Artificial respiration; oxygen; treat on general principles.
Iodine	Thirty grains of sodium sulphite or common 'hypo' in water; two or three teaspoonfuls of solution of saccharated lime in water; mucilage of starch, tragacanth, or arrowroot; linseed tea, &c.
Lead Salts	Epsom or Glauber's salt in water. Stomach tube; emetic.
Mercury Salts: Corrosive Sublimate, White or Red Precipitate	Emetic; stomach tube; copious draughts of milk; white of egg beaten up in milk.
Opium: Morphine, Chlorodyne, &c.	Stomach tube, emetic; potassium permanganate (10 gr. in a pint of water). Brandy, ether, ammonia, strong coffee. Keep patient moving, and stimulate body. Artificial respiration.
Phosphorus: Rat-paste	Stomach tube; emetic; 2 gr. copper sulphate in a little water. Half a teaspoonful of Sanitas in water at intervals of twenty minutes *of first hour*. Copious draughts of milk. *Avoid oil.*
Silver Salts	A tablespoonful of common salt in warm water both as an antidote and as an emetic; white of egg. Milk.
Strychnine: Vermin-killer	Prompt emetic or use of stomach syphon; 20 gr. tannic acid in water; very strong tea made by *boiling* the leaves; a draught containing potassium bromide 1 dr., chloral hydrate 20 gr. Chloroform inhalation between spasms; amyl-nitrite inhalation between spasms.
Zinc Salts	Sodium or potassium bicarbonate in water; soap solution; tannic acid; copious draughts of milk.

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